APPENDIX III

TAB I

Page 6

a trial in Georgia?
A. Yes, I testified at one trial in my life, and that's the one.
Q. Have you ever been a party in a lawsuit?
A. Yes.
Q. Just briefly tell me the nature.
A. Sure, I in my life filed two pro se lawsuits. The first one was when we bought a house in Seekonk, Massachusetts in 1980, and at the time of closing, there were a certain number of things, putting screens on the house, finishing some interior work, which were not completed. I agreed with the attorney for the bank and with the builder from whom we were buying the house to put $2,000 into escrow until those items were completed. Three months after the closing he still had not completed them. I called up the attorney saying I will get these items done, and then I will bill the escrow account, and he called the builder, his client, the seller, and said my client doesn't agree to that. You'll have to get a court order against us, at which point I filed a lawsuit pro se in the district court in Taunton, Massachusetts, one a default judgment and got the work done.

Page 7

Q. If I may -- excuse me for interrupting, but obviously, that wasn't dealing with the issue of intelligent design?
A. No.
Q. And the second one?
A. No, the second one dealt with a zoning matter when we were attempting to purchase a house.
Q. Okay. I just want to sort of cover a few ground rules, which will hopefully make this deposition go a little bit easier for all of us here. First of all, it's going to be important for the two of us to speak up and speak clearly because our court reporter here is going to try and diligently take down everything that is said during the course of the deposition. Do you understand that?
A. I certainly understand that.
Q. And certainly this case involves some scientific matters and scientific issues that may require some definitions and words and things that the court reporter may not be familiar with. So we want to make sure we go slow and at times I may ask you to stop and spell the words.
A. Of course. That would be fine.

Page 8

Q. It's going to be important also that you answer the questions in words rather than gestures and using terms like uh-huh and uh-uh because obviously, she has to make a written record of this. Do you understand that?
A. I understand that, too.
Q. And perhaps one the most important rules, which are on the border of violating already, is that we've got to make sure you don't start answering a question until I'm done asking it, and I will likewise not ask a subsequent question until you're done answering. In normal conversation you tend to anticipate the question and you want to start answering it, but the two of us can't be speaking at the same time because it makes it very difficult for our court reporter. Okay?
A. Okay.
Q. And if we're violating that rule as we go along, I'll probably make some gentle reminders of that.
A. Much appreciated.
Q. And so you understand that the deposition is being recorded by our court reporter and everything stated during the course of the

Page 9

deposition will be recorded by her?
A. Yes, I do understand that.
Q. And you understand that your testimony this morning is being given under oath as if given in a court of law?
A. I understand that, as well.
Q. Sir, there was a lawsuit filed against the Dover Area School District and the Board of Directors regarding changes that they made to the ninth grade biology curriculum. Do you understand that?
A. Yes, that's what I understand.
Q. And there was a complaint that was filed in this case, which is a legal document that commences the lawsuit. Have you read that complaint?
A. Yes, I have.
Q. If you could, tell me what your understanding is of the nature of the controversy of this particular lawsuit?
A. The -- my understanding of the nature of the controversy stems from when I was first contacted -- and I can't remember the name of the person -- when I was first contacted by a

Page 10

representative of the company that publishes my high school textbook, the Prentice Hall Company, and the representative told me that the Dover High School had selected our textbook as one they wanted in their biology classes but that the approval of that textbook by the board of education or board of directors, whatever they're called, was being held up because of the comments of some members of the board of education that the book was laced with Darwinism and didn't give a fair treatment of creationism or creation science. I can't remember exactly what the representative told me. She then advised me that I could probably learn what was going on at some of the board of education meetings by reading the York Daily Record over the internet, which I then did. And since that time, I have followed as best I can by reading the internet the accounts of board of education meetings, the comments of various members of the board of education, the comments of school teachers at a Dover Area High School, and my understanding is that the board of education after much debate went ahead and approved the purchase and use of the textbooks. My further understanding is that the board of

Page 11

education accepted I think it was a donation of 40 to 50 copies of the book "Of Pandas and People," which I believe were then placed in a library or media center, so that they would be freely available to student.

And also, that the board of education began to consider how best to alert students to the presence of these alternate books, Pandas and People, in the library or media center, and also to try to find a curricula formula by which teachers could introduce alternative explanations for biological origins such as intelligent design.

So that's how I first became aware of the controversy, and needless to say, although my own reading of the York Daily Record tells me that many people in the community were indeed in favor of what the board of education had started to do there were also many people who were opposed to what the board of education had started to do, and I would imagine that the development of a lawsuit basically came from those people opposed to the board's action.

Q. Sir, you stated that you had some conversation with a representative from your publisher of your textbook?

Page 12

A. That's correct.

Q. Did you have any conversations with any direct -- either through e-mail or correspondence with any Dover area school district teachers or administrators?

A. When the controversy -- when I first became aware of the controversy, I went online. I found the Dover area school systems web page. I found the web page for Dover High School, and I e-mailed the science supervisor and at least one of the biology teachers, and I indicated to them that if they or people in the community had any questions about the textbook, I would be happy to answer them, that I would be happy to come to Dover in person and answer those questions to reassure members of the community that our book was a book of science, that it was not antireligion and certainly not antiChristianity, and I basically told those folks that I was at their disposal.

I believe I got a response from one of the teachers that basically said thank you very much for your support. We don't have anything we would ask you to do right now. And that was really the extent of my contact with the Dover Board, about three or

Page 13

four e-mails exchanged that way.

Q. Were you ever asked to follow up and provide any information that you offered?

A. No.

MR. MUISE: Let me mark this as the first exhibit, please.

(Defendant's Exhibit No. 1 was marked.)

BY MR. MUISE:

Q. Sir, if you can take a look at what has been marked as Exhibit 1, and it purports to be an e-mail from you to Drs. Peterman and Spahr?

A. Correct.

Q. Do you know if Spahr is a doctor?

A. Actually, I do not, but I follow the advice of many people and my mentors in the scientific community that it's much better to give someone a title reflective of education and then have them correct you than to address them as Mr. or Ms. and then suddenly have to be told that, in fact, they deserve the title of doctor. So I simply made that assumption.

Q. In the initial e-mail that you're just testifying to, is this the e-mail that you're referring to?

Page 14

A. Yes, it is.
Q. Is this the one that you received a relatively short reply, thank you for your support?
A. To be perfectly honest, I'm not positive if I received a reply by e-mail or if I received no reply and then made a telephone call to one of these people and they then told me verbally thank you very much, we don't have anything for you to do right now, but one way or another I got that message.
Q. If you look at the second full paragraph of this e-mail, Exhibit 1, you reference the fact that you and Joe -- and I'm assuming that's Joe Levine, the coauthor of the biology textbook?
A. That's correct.
Q. You said, "I have gone to great lengths to assure teachers, parents, and students that evolutionary biology does not present a challenge to religion, certainly not in the way that some members of your community seem to fear." Did I state that correctly?
A. Yes, you read that correctly.
Q. Could you explain to me what the basis of that statement is? You said you went to great lengths. Could you explain that a little bit?

Page 15

A. Yes, I'd be very happy to. Evolution is a controversial issue in many areas of the country, and when Dr. Levine and I first began to write biology textbooks which were available for use around the country, we very quickly received requests from teachers, from parents and sometimes from the sales representatives of our publisher to explain how evolution, which I believe is covered very thoroughly in our textbook, could be understood in a way that didn't present a direct challenge to religious beliefs.

Dr. Levine and I then drafted a statement, which is probably four or five pages long explaining how and why we covered evolutionary biology in our textbook, and also that it was the view of mainstream scientists, scientific institutions and some of the most eminent scientific authorities in the United States, including the National Academy of Sciences, that evolution is in no way antithetical to religion in general or to Christianity in particular. And one of the things that I -- and in terms of going to great lengths, in addition to preparing that document, Dr. Levine and I in various school districts around the country have often been

Page 16

called upon to speak directly usually by telephone to board of education members to reassure them of exactly that fact.

The other point that I made, which is later in the e-mail in a passage that you have not referred to, at least not yet, is I pointed out that several years ago I wrote a trade book widely available from book stores and from online services called "Finding Darwin's God," and the subtitle of that book is "A Scientist's Search for Common Ground Between God and Evolution." So in the passage that you referred to when I said great lengths, one of those great lengths was writing a whole book on the issue.
Q. Now, your biology textbook obviously covers other theories than evolution, correct?
A. Yes, it does, and science or the whole scientific process is built around theories, and the theories that are covered in that book would include things like atomic theory of matter, which is implicit in the chemistry section of the book, the germ theory of disease and the cell theory.
Q. Do you get a typical response -- as you just described the response you received regarding

Page 17

the theory of evolution, do you get any similar response to those other theories that are addressed in your biology textbook?
A. I am tempted to say no, but I do have to tell you that when -- there are certain aspects, for example, of the germ theory of disease, which in my history as a textbook author, which now goes back about 15 years, have indeed been regarded as controversial. One of the things that Joe and I have -- Dr. Levine and I have always written about very clearly and very explicitly, because we think it's an important message for young people to understand, is the relationship between the HIV virus and AIDS and try to emphasize to students, to young people that this is a tremendous risk factor in terms of sexual behavior, and certainly is something that they want to think about and they want to think about carefully.

Over the years -- and this goes back to the early 1990s -- I have received correspondence and e-mail -- and I don't have copies of any of it but I certainly remember it -- arguing that HIV is not the cause of AIDS and that there are other lifestyle conditions or drug use or other things

Page 18

that actually cause HIV. So you could say, therefore, that that aspect of the germ theory of disease is regarded by some people as being controversial.

Q. With regard to I guess the quality or quantity of the controversy, evolution compared to those other theories, do they compare?

A. No, they don't compare. By far the most -- the largest amount of comment with respect to controversy deals with evolution.

Q. And was that part of the reason that precipitated your writing "Finding Darwin's God?"

A. I suppose so, yes. I think I would say yes because, you know, there is -- the subjects that are controversial, of course, make for good reading, but the real reason that precipitated the writing of that book was throughout the 1990s, I found it to be an increasingly common assumption that evolutionary biology is antithetical to Christian belief, and since I have never believed that and I do not believe that now and most mainstream Christian religions don't think so either, I thought it was important to write a book from the point of view of a biologist and a believer laying out that fact in

Page 19

as much detail as I could for the popular reading audience.

Q. And that book also makes reference to scientific theories, does it not?

A. Yes, it does.

Q. I'll have some more questions about that afterwards, as you can probably imagine. I want to kind of back up and cover a couple of points that you addressed in one of your other answers. You mentioned that your textbook thoroughly covers the theory of evolution; is that correct?

A. Yes, I believe it does.

Q. I believe I've read somewhere that you do competitive analysis of other high school biology textbooks, do you not?

A. Yes, from time to time the sales representatives of my company have asked me to compare and contrast the strengths and weaknesses of our book with other books, and I certainly have done that.

Q. In your review of other science textbooks, how does your textbook compare with regard to the coverage of evolution?

A. My own analysis of it suggests that we're

Page 20

comparable, that we're about the same as other textbooks. I will very often when I do a competitive analysis try to find an area where I think another textbook is weak or lacking or inadequate in a scientific concept that might be important to teachers and, of course, our sales representatives would like to know, much the same way that any salesperson would like to know the strength of their own product, to the extent you call a book a product. But I do have to say that evolutionary biology and the coverage of evolution is not one of those areas that I have faulted the textbooks produced by other major publishers. I actually think they're all pretty good in that respect.

Q. How many chapters of your textbook cover evolution?

A. Well, the straightforward answer -- there's a short answer and a long answer. The short answer I think is four. Unit five of the textbook is specifically called evolution, but evolution is really the central organizing principle of biology, and in many respects it's impossible to write -- it's impossible to do what we call phylogenetic

Page 21

survey, which is a survey of animals and plants of various types, and it's impossible to look at the systems of the body, the physiological systems, without bringing in evolution as a way to explain why certain systems are the way they are or why certain organisms are structured or have life cycles the way that they do.

So evolution is found really in a great deal of the book, and that's true not just of our textbook but of the other competing textbooks, as well.

Q. Now, the textbook that you wrote that we've been referring to, it's your understanding that the school board did, in fact, adopt that as their textbook for the Dover High School?

A. That is my understanding.

Q. And that's, I believe, the 2004 edition?

A. That is also my understanding.

Q. I believe it's referred to as the dragonfly book?

A. Yes, it is.

Q. I'm assuming you don't have any objections with the school board making that decision?

A. No, I was quite pleased. I consider it to

be a ringing endorsement of our book.
Q. Now, you mentioned previously that you're aware that the school had donated to them a number of copies of the book "Of Pandas and People," correct?
A. Correct.
Q. And it's your understanding that that book was placed in the library?
A. That's my understanding from reading the York Daily Record.
Q. Do you have any objections to that book being in the library?
A. To be perfectly honest, my feeling is that the books that are placed in the library of the Dover area public schools are -- what books are placed in the library of the Dover area public schools is a decision for the school administrators, the board of education, and the people of Dover. So I generally do not pass judgment, positive or negative, on the books that communities and school districts choose for their library.
Q. Do you have objection to that book being referenced in the ninth grade biology class?
A. I will give you the same answer that I

just did, which is that the educational decisions that are made by local communities around the country are their business, and my feeling is it is not my place as a resident of the State of Massachusetts and a professor at Brown University to either approve or object to decisions regarding science curricula in a community in which I do not live.
Q. Sir, I want to review again some more of sort of the -- some of the factual things and see what your understanding may or may not be of these. One is it's my understanding, and see if you share the same understanding, that the school district is teaching the theory of evolution in the ninth grade biology class per the Pennsylvania State Standards; is that your understanding?
A. My understanding is that the Board of Education has made it very clear -- and again, I have followed this by reading the York Daily Record, so I'm tempted to paraphrase Will Rogers and say the only thing I know is what I read in the papers. My understanding is that the board of education has made it clear that teachers will follow all aspects of the state curriculum of Pennsylvania, including

evolution.
Q. And do you have any objection to that?
A. I'll reiterate my earlier answer, which is I do not feel that it is my place to either approve or object to curricula decisions that are made by the State of Pennsylvania or the Dover area school board.
Q. Now, my understanding is when you're drafting your textbook -- for example, the one that's used in Dover -- you will consider or review the national and the state standards to ensure that your book comports with those; is that correct?
A. That is correct.
Q. Is it your understanding that the 2004 version of the dragonfly book comports with the Pennsylvania State Standards for teaching evolution?
A. That is also my understanding, yes.
(Defendant's Exhibit No. 2 was marked.)
BY MR. MUISE:
Q. Sir, I'm handing you what's been marked as Exhibit 2, which I'll represent to you is a page from the "Academic Standards For Science and Technology," and that's from the Pennsylvania Department of Education, and the date on this is

January 5, 2002. And if you look at the right-hand column and the way my understanding is of how you read these is this the state standards and by grade 12 it says under A, "Evaluate the nature of scientific and technological knowledge," and then if you continue down to the second bullet point, it says, "Critically evaluate the status of existing theories," and they have in the parenthesis, they list five different theories, one of them being the theory of evolution. Do you see that?
A. Yes, I do.
Q. Again, do you have any objection to that state standard?
A. No, I have no objection at all.
Q. Now, of those five theories that are listed in the parenthesis, how many of those are covered in your biology textbook?
A. Well, let's see. The germ theory of disease is certainly covered. We mention light, but I do not think that the wave theory of light is covered in enough detail to count it as being covered in our books. The classification of subatomic particles, we mention three elementary subatomic particles in our book, but I certainly

Page 26

think it's not fair to say that we really present that as a theory. The theory of evolution, yes, we do; and the epidemiology of aids, yes, we do that, as well.

Q. So you don't have any problem with the state identifying specific theories for critical analysis?

A. Once again, I have absolutely no problem, although I do note that the listing follows the abbreviation e.g., which usually means for example. So those five theories are not listed as the only ones to be critically analyzed. They were simply listed as examples, and obviously, that bullet point means that existing theories and here are some examples, but all existing theories should be subject to critical analysis -- critical evaluation, excuse me.

Q. Now, you've drafted or created the biology book with critical thinking being one of the goals of the book; is that correct?

A. Yes, that is correct.

Q. And critical thinking I'm assuming you would agree is a legitimate pedagogical goal of a school?

Page 27

A. Not only is critical thinking a legitimate pedagogical goal, I think it's an important component of teaching science.

Q. Now, I mentioned to you that they -- my understanding and I believe you said you understood, as well, that they were going to be teaching pursuant to the Pennsylvania State Standards teaching the theory of evolution; is that correct?

A. That's my understanding.

Q. Is it also your understanding that the students will only be tested on these state standards regarding the theory of evolution?

A. I'm sorry. Maybe I'm listening too carefully to your question, but I believe you said the students will only be tested on state standards regarding the theory of evolution. I think they'll be tested on many topics besides the theory of evolution.

Q. My question wasn't clear, and I apologize. My understanding is Dover is a state standards' driven school, as most public schools are; is that your understanding?

A. Yes, it's my understanding, as well.

Q. And so what will appear on the tests for

Page 28

the students in biology regarding the theory of evolution will be the state standards, meaning they'll be tested to the state standards on the theory of evolution in their biology testing; is that your understanding?

A. That's certainly my impression. I don't have any detailed knowledge of exactly how Dover students will be tested, of course.

Q. Do you believe that they're going to be tested on intelligent design in the ninth grade biology class?

A. As I just said, I really don't have any actual understanding of what they will be tested on. Because Pennsylvania law, as I understand it, requires students to be tested on elements of the curriculum, I would suppose that that will also take place in Dover, but what I do not know is whether or not the Dover district or Dover teachers, since my understanding is that they have made reference to or introduced the concept of intelligent design, I don't know if students will be tested on that or not. I have no way to find out.

Q. Does that make a difference to you with regard to your opinions that you offer in this case,

Page 29

whether or not the students will be tested on intelligent design?

A. You said does it make a difference with respect to the opinions I would offer in this case. I don't think so. I think I would -- if you were to tell me -- to try to be as clear as I possibly can, if you were to tell me that the students will be tested on it or if you were to tell me that the student will not be tested on it, I nonetheless believe the opinions that I will offer in this case would be pretty much the same.

Q. Sir, is it your understanding with regard to the changes that have been made to the biology curriculum in the ninth grade at Dover High School, that pursuant to those changes the superintendent who's responsible for executing the curriculum and the policy has directed that intelligent design is not going to be taught in ninth grade biology class? Do you understand that?

A. I have to say that I'm not entirely clear about that, and again, this comes because I have no direct knowledge of what went on in any classroom in Dover, and I can only rely on reports in the newspaper as to what happened, but my understanding

Page 30

is that school administrators went into each of the biology classes in Dover and read a prepared statement that was -- and which I cannot quote verbatim but was designed to make students aware of what were known as alternative theories of origins. I believe that intelligent design was mentioned by name as one of those alternative theories, and students were made aware of the existence of material on intelligent design in the school library or media center.

Now, I don't know if I want to parse the word teach too closely, but it certainly seems to me that if you mention a theory as an alternative and you say there is material about that in the library and you encourage students to study that material, I think in certain respects that involves teaching.

Q. And it's my understanding that you have objection to making intelligent design -- making students aware of intelligent design in biology class by way of reference; is that correct?

A. As I've said repeatedly, I don't think it's my place to approve or object to what a particular school district does or does not do. If I were asked for advice on this matter, I would say

Page 31

that what is best presented in the science classroom is science, and since intelligent design in the opinions of the most authoritative scientific bodies in the United States, including, for example, the National Academy of Sciences has not met the standard suggested of a scientific theory, it's my opinion that it doesn't belong in a science classroom.

Q. So is it your opinion then nonscientific materials have no place in a science classroom?

A. Not necessarily and the reason for that is one of the ways in which science is taught is by referring to what you might call nonscientific materials, and those might include making analogies about the way in which living things work. Analogies are colorful and useful to understanding, but they're certainly not scientific ones, and I can imagine that other material that is taken from outside of science. The plots of movies or books could be used to illustrate concepts. For example, I'm aware of a number of physics teachers who try to illustrate principles physics, such as Einstein's theories of special relativity by using examples from the movie Star Trek -- the movie and TV series

Page 32

based on Star Trek and that Star Trek is certainly not a scientific series, but the use of science fiction can sometimes have a place in the science classroom.

So I would certainly agree that sometimes in the classroom you can bring material from outside of science to illustrate and liven examples in the classroom.

Q. Would that also hold for the theory of evolution; for example, bring in nonscientific materials to further buttress or support the particular theory?

A. The way you phrased the question the answer would be no because I don't think you bring the nonscientific materials to support the theory, as you phrased it. I think you might use them to illustrate the operation of a theory.

Q. For example, the dialectical opposite use it for -- to demonstrate the argument of the theory of evolution?

A. Sorry. I don't understand the question. I know what Hegel's dialectic is, but I don't understand the dialectical opposite as you used it.

Q. Well, Professor Campbell has provided an

Page 33

expert report in this case. Have you read any of the other expert reports?

A. I have not read Professor Campbell's. I have read Professor Padian's, and I've read Professor Behe's, and I've read Professor Dembski's. I'm trying to think if I read any others. That's a list of the ones I have read.

Q. Well, Professor Campbell describes science as argument. That's a philosophical view he takes towards science. Do you agree with that proposition?

A. No, I don't. I think argument by which I would mean the clash of different ideas and explanations is certainly part of science, but I would not define science as argument.

Q. How would you define science?

A. I would define science as the systematic search for natural explanations of natural phenomenon.

Q. Would you subsume the argument theory that Professor Campbell presented in your definition of science?

A. Now, remember I haven't read Campbell's statement. So I don't know if you're making

Page 34

reference to that, but what I heard you say was that Campbell defines science as argument, and would I include that definition, and the answer to that is no. I would not -- I would never include just argument as a definition of science.

When I said -- I'll try to remember my words -- science is the systematic search for natural explanations. Part of that search for explanations is the weighing of one explanation against another with respect to how well they fit the facts of experiment and observation. When you try to do that, different individuals may, in fact, argue with each other as to which explanation is the better part, and that's why I said that argument is a part of science or perhaps it's more accurately put that argument is a part of a scientific process, but I think it's a mistake to say that science itself is argument.

Q. And I guess to be more clear on my question I think you answered is that argument is subsumed in your definition of science. It's a component of science?

MR. WALCZAK: I'm going to object because you asked the identical question, and he

Page 35

just gave what I thought was a pretty comprehensive answer, and if you want to ask him to answer that again one more time, that's okay, but that was the exact same question you just asked.

BY MR. MUISE:

Q. Let me ask this, sir. You obviously reference in your biology book "The Origin of the Species" by Charles Darwin, correct?

A. Yes, we do.

Q. Would that be an appropriate reference book for biology students?

A. Would it be an appropriate reference book for biology students? The literal answer to that question is no, and the reason for that is the book was written in -- first edition was written in 1859. At this point in time, Darwin's book on "The Origin of Species" is important as a document in the history of sciences. So I would certainly urge students to read on "The Origin of Species" to understand the history of the development of the theory of evolution, but I would not regard it as a reference book for the very simple reason that science has moved and progressed so much in the

Page 36

nearly century and a half since Darwin's book was published.

So, no, I would not recommend "The Origin of Species" as a reference book. In fact, I would not recommend any book from the 19th century or even the 20th century up until about oh, 10 or 15 years ago as a reference book strictly speaking for a science classroom.

Q. Would it be an appropriate nonscientific material -- strike that. I asked you the question about whether it be a reference book, and perhaps you had a specific meaning to the term of a reference book. In the general sense, if it was referenced in a biology class and placed in the library for the students to review to see what Darwin said about his theory of evolution, would you have any objection to that?

A. I'll answer the question on several levels. Once again, I am not in the business of approving or objecting to the placement of books in libraries and school systems in districts in which I do not live. If I was asked for my advice as to whether or not "The Origin of Species" is an appropriate book to have in the library, the answer

Page 37

to that is yes and for the reasons that I stated in my answer to your earlier question. It's a very, very important book to show the history of the development of a very important scientific idea, which is evolution.

Q. Now, in "The Origin of Species" did not Darwin set up his argument against a design hypothesis or design theory to help best explain his theory?

A. It is fair to say that Darwin himself referred in his correspondence "The Origin of Species" as "one long argument," and this relates to my earlier statement that argument is a part of the process of science. In writing The Origin Darwin compared and contrasted his explanation of descent with modification as guided by natural selection with other alternate explanations, and one of those, of course, was the notion that living things and all of their characteristics had been designed by some sort of an outside force or power, and the weight of the argument, as subsequent years of scientific investigation have made very clear, is that Darwin's explanation because it unified all of life into a single whole and it fit the facts extremely well has

Page 38

been the one that has prevailed in the scientific process.

Q. Obviously, his theory when it came out in 1859 wasn't well accepted by the scientific community; is that an accurate statement?

A. I'm not a historian of science, and I'm not being asked as an expert to comment on the history of science. But when you say that it was not well accepted by the scientific community, my own understanding from reading books about Darwin's life and his discovery is that that statement is not true, that his ideas were enormously provocative, that they were found to be very persuasive by a large segment of the scientific community and that major objections against his theory were actually settled rather quickly and in his favor.

Q. Sir, what do you see as the purpose of the ninth grade biology class?

A. I think the purpose of a ninth grade biology class is to expose students to the science of biology, give them an understanding of the living world of which they are a part, including the organisms that surround them and, in fact, their own bodies and their own lives, and also to help them

Page 39

appreciate and understand the importance of scientific research and scientific thought in their lives.

Q. Let me ask you if you would agree with this statement. The purpose of high school science courses should not be to train scientists but to contribute to the liberal education of students by initiating them into our ongoing cultural conversation about how to make sense of the world?

A. May I ask where that statement comes from?

Q. Certainly, I'll represent to you it comes from the expert report presented by Professor Warren A. Nord. If you'd like, it's the highlighted portion, and I don't intend to mark that as an exhibit, unless Vic, you have an objection.

MR. WALCZAK: No objection.

THE WITNESS: I'll tell you what I agree with in the statement. The purpose of high school science courses should not be to train scientists, I agree. But to contribute to the liberal education of students, and I agree with that, as well. The part I object to is the last part, and that is by initiating them into our ongoing

Page 40

cultural conversation about how to make sense of the world. What this statement does, I think, is to conflict science and scientific investigation with culture, and I think that's a terrible mistake.

Science, in fact, has prospered around the world and over the last several centuries precisely because the scientific method and scientific investigation transcend culture, and a statement like this it seems to me would make science culturally relative. In other words, it would reduce science to a relativistic discipline in which people of different culture would have different standards of scientific analysis, different scientific theories all culturally relative, and I completely disagree with that concluding part of the statement.

BY MR. MUISE:

Q. Is not the question of what is science a philosophical question?

A. That's an interesting and provocative question. It is certainly true that there are

Page 41

philosophical issues that are associated with science, the nature of truth, the nature of the world around us, and you could I think well say that the question what is science broadly construed is certainly a question that philosophy would have something to say about, but I won't agree completely with that assertion for the following reason, and again, it relates to some of the things that I just said in the answer to your previous question. What has made western science powerful and all encompassing and universal in the sense that the science that is done in China and in Japan and in Africa and in Brazil and in the United States is science that transcends different cultures and different philosophies.

So the notion that science is, as I mentioned before, the systematic search for natural explanations for natural phenomena I think is a definition that transcends different philosophical schools and certainly transcends different cultures, and that's one of the reasons why science and the scientific method has been so powerful and so all encompassing.

Q. Now the definition of science that you've

Page 42

been using, would you -- and this may go back to whether or not -- your expertise on the history of science, but in terms of your understanding was that a definition that would have been applied prior to Darwin's writing "The Origin of Species?"

A. Again, as I said before, I do not think that I am qualified as a historian of science, but based on my own understanding and my own reading of scientific history, the answer to that is yes, it would have been applied prior to Darwin.

Q. So you don't see Darwin's writing as having changed sort of the philosophy of science?

A. Oh, now, hold on for a second because that's an entirely different proposition than follows for my answer to the previous question. I think Darwin's writing and Darwin's work certainly changed the biological sciences forever and instituted a scientific evolution. I don't think, however, it initiated a philosophical change in science because the process of seeking natural explanations for natural phenomena is exactly what was followed by Kapernekas, by Kepler, by Galileo and by Dalton and the other pioneers of the physical sciences before Darwin in essence applied the same

Page 43

technique, the same approach to the biological sciences.

Q. What was the scientific revolution then that he created?

A. What Darwin -- again, I want to say that I make no claims to be a historian of science or a Charles Darwin scholar, but my own reading of scientific history is that Darwin for the first time made it possible to look at all living things as intrinsically related and to provide an explanation for how living things were distributed in terms of what we call biogeography and the way in which living organisms were structured that spoke to their origins by the process of what Darwin called descent with modification from a common ancestor, and that was indeed a revolutionary concept in 1859.

Q. We finally get to this question. So you were obviously retained by the plaintiffs to provide expert testimony in this case; is that correct?

A. That is correct.

Q. And what are the areas of expertise in which you intend to be offering your opinions?

A. I am a cell biologist. I have 31 years experience since my Ph.D. as a research scientist,

Page 44

and I am also an educator, and I have taught at the university level for the same 31 years, and in the last 15 years I have written a series of high school and college textbooks. I have also been involved for almost -- I've been involved for 24 years in ongoing discussions of the scientific integrity and scientific validity of evolution; and therefore, my expertise, I believe, would encompass the direct field of my research, and cell biology involves biochemistry, molecular biology, genetics and cell biology itself, the conflicts of the last quarter century with respect to the teaching of evolution and the current scientific support for evolution and also the field of science education based on my own teaching as a university professor and my own involvement in writing and textbooks that have been written for college and for high school students.

Q. In your field of science education -- and this may be related to your prior answers regarding school district policies and curriculum -- do you have any expertise in drafting curriculum related to science or school policies related to science?

A. I have over the years served as an informal advisor to the Providence public schools

Page 45

trying to help them from time to time to craft a curriculum that they could implement in the Providence public schools that matched or that complimented -- that would be a better word -- complimented the National Science Education Standards and the Rhode Island State Standards. Aside from that informal advising, which incidentally I have not actively done in the last five years, that's the extent of my experience in drafting science standards.

I have been asked for my opinion about science standards in the State of Texas and the State of Kansas, and I have offered my opinion in both cases, but I played no role in helping to draft any of the standards.

Q. You don't have any advanced degrees in education or educational leadership or in that particular area, do you?

A. No, sir, I do not.

Q. How does a cell biologist differ from a microbiologist?

A. It's an interesting question, and in many cases the lines are blurred between the various disciplines. The traditional definition of a

Page 46

microbiologist is someone who works with bacteria and other procaryotic organisms. The traditional definition of a cell biologist is someone who works with organisms in general at the cellular level.

Now, most of my research work has been on the structure and function and organization of biological membranes and membrane proteins in eukaryotic organisms. These are organisms that have a cell nucleus. Having said that, if, for example, you were to attend the annual meeting of the American Society for Cell Biology, you would find dozens, perhaps a hundred or so papers presented at that meeting that could conceivably fall under the classification of microbiology because they concern bacteria or procaryotic organisms.

There has been certainly in the last quarter century in the life sciences a tendency to blur the distinctions between specific fields, and one aspect of that blurring has certainly occurred between microbiology and cell biology.

Q. And a similar question with regard to cell biologists and biochemists?

A. Right, and same answer, actually, which is to say I am a member of the American Society for

Page 47

Cell Biology. I chaired the education committee of the American Society for Cell Biology. I have served on the governing counsel of that society, and once I was the scientific chairman of the meeting. We call it the program committee, which means that I actually set the scientific program.

If you went to the meetings of the American Society for Cell Biology and you also were later in the year to attend the meetings of the American Society for Biochemistry and Molecular Biology, which is the major biochemical society, you would probably find that 50 to 60 percent of the scientific presentations at those meetings could, in fact, be at either meeting. So increasingly cell biology has moved as science has advanced into biochemical explanations for cellular phenomena and increasingly biochemists have been interested in the cellular implications of their work at the level of biochemistry. So a cell biologist today, the work in cell biology must of necessity involve molecular biology, biochemistry and to some extent microbiology and very often these days genetics, as well.

Q. And you obviously consider yourself a

Page 48

scientist?

A. Yes, I do consider myself a scientist.

Q. And that would be the same, a microbiologist would be considered a scientist?

A. A microbiologist is also a scientist.

Q. And a biochemist is a scientist?

A. Yes, indeed.

Q. I know you made reference previously to Professor Michael Behe. Do you know him?

A. Yes, I do know Michael Behe.

Q. He's a biochemist at Lehigh University?

A. That is correct.

Q. Do you know Professor Scott Minnich?

A. Yes, I've met Scott Minnich, and he, I believe, is at the University of Idaho.

Q. And he's a microbiologist?

A. That is correct.

Q. And just to be clear, the expert testimony you're providing is within your field as a scientist and expert in cell biology, as well as, I believe, you said science education. Is that an accurate summary?

A. Yes, that is an accurate summary.

Q. And again, just to be clear, you're not

Page 49

providing expert testimony in philosophy and as a philosopher?

A. Oh, no, absolutely not. I am not providing expert testimony as a philosopher, even though you have asked some questions about philosophy.

Q. Right. And just by way of background, so you're not an expert on the philosophy of science?

A. No, I am not.

Q. And you're not an expert in theology?

A. I am not an expert in theology. I have read some theology. I wrote a popular book on what might be called the theological implications of science; and therefore, theology is a subject that interests me, but I would certainly not qualify myself as an expert in theology.

Q. Similarly, you're not an expert in mathematics?

A. No, I am not. I have studied mathematics through calculus and through the level of linear algebra. I'm familiar with set theory. Like anyone who does research in science I understand probability and statistics because I use these tools every day in my research, but I would certainly not

Page 50

I say that I was an expert in mathematics.
Q. How about with regard to the field of paleontology?
A. Same answer as I gave for theology and I gave to some extent for mathematics. I am not trained in paleontology, but being interested as I am scientifically and educationally in evolution, I've read a great deal about paleontology. When we have paleontological seminars here at the university, I attend nearly all of them because I find it to be a subject that's very interesting. It has implications for my textbook writing and my teaching. So I try to follow it very closely, and I also think that I am conversant with the arguments made from paleontology against evolution, but once again, I would not qualify myself as an expert in paleontology.
MR. MUISE: I just want to mark these. I think we're up to Exhibit 3.
(Defendant's Exhibit No. 3 was marked.)
BY MR. MUISE:
Q. If you'd like take a look at that, sir. That was a copy of your CV provided to us by plaintiffs' counsel. Does that appear to be what it

Page 51

is?
A. Yes, this looks like the CV that I prepared for the plaintiffs.
Q. Does this include all of the formal education that you have received?
A. Yes, it does.
Q. Is it a complete listing of the scientific papers that you've presented?
A. Yes, with one exception of note, and that is the article -- the last article I list on page six under essays and reviews I believe since I handed in this CV this last article which I listed as in press has been published, and I believe -- I'd have to check this, but I believe it's been published with a slightly different title, and the title of the article is "The Flagellum Unspun," but that is the title of the volume, that is the publication and those are the editors of the volume. So it needs to be updated since I submitted it, but it is otherwise accurate and complete.
Q. The item that you're referring to, which according to the CV is going to be appearing in -- is the title of the book an essay from Design and its Critics?

Page 52

A. No, I actually have -- I just received the book, and I have it upstairs, and I can check the exact title, but the -- and I'm sloppy in my italics. I should have said in press an essay from the book called "Design and Its Critics," but I can go upstairs and check.
Q. And the editors of that book are --
A. Wil -- I'm sorry. I'm doing what you told me not to do. Go ahead.
Q. The editors are William Dembski and Michael Ruse?
A. That is correct. Should I make reference to this?
MR. MUISE: Do you have this?
MR. WALCZAK: I do.
MR. MUISE: And what he was referring to is an article "The Flagellum Unspun. The Collapse of Irreducible Complexity" by Professor Miller.
BY MR. MUISE:
Q. And that's -- the article that we just referred to is what's going to be appearing in this book publication?
A. It is what has appeared in the book. It

Page 53

has now been published.
Q. And this book was published by Cambridge University Press?
A. I believe that is correct.
Q. Tell me what the nature of that book is.
A. I believe the nature of that book is that in the follow-up to a conference at Concordia College in Wisconsin, which I believe was held in 2002 -- I could be a year off but I think it was 2002 -- that brought together a number of people promoting the idea known as intelligent design and a number of people, including myself, who were critical of that idea. William Dembski and Michael Ruse decided to solicit a number of essays from the people involved in that discussion and publish them as a book. So I believe that's the development of the idea is to have essays pro and con on the idea of intelligent design.
Q. Now, this conference you said was at Concordia?
A. I think so, yes.
Q. Was it one of those conferences where you just submit papers or was it actually an active conference with students and others participating?

Page 54

A. There were no papers submitted to the conference. The conference rather was a series of platform presentations about 30 minutes in length each and some discussion following contrasting papers.
Q. Was it a well-attended conference?
A. It depends on what you mean by well attended. There were probably 30 participants in the conference, and I would say 70 or 80 people who were not participating but simply attended the conference to hear what people had to say.
Q. I'm assuming that a purpose of that conference was educational, since a university or college was putting it on?
A. You would have to -- the Concordia College hosted it. I'm not exactly sure who organized it or who put it on, as you say. I believe the conference also -- and I'm not positive about this -- but I believe the conference took place during a vacation break for the college. So I doubt very much that the purpose was educational in that sense.
Q. You list on your CV on the last page, page seven, a couple of -- you categorized under general audience books, the first one being "Finding

Page 55

Darwin's God," which we've referenced already in this deposition. A the seconded one it's listed "Only a Theory: Evolution and the Battle for America's Soul," and you have in parenthesis "manuscript in preparation." Do you actually have a written manuscript of that second book?
A. No.
Q. It's a concept at this point?
A. It's a little farther along than a concept. I developed the idea for this book over the last several months and have presented it to several publishers -- quite a few of them are interested -- and according to my literary agent in New York, I now have an agreement in principle with Viking Books to sign a contract as soon as the contract is drawn up for this book and to write the book over the next 12 months.
Q. What's the general concept of the book?
A. The general concept of the book is the criticism that has been leveled against evolution in a variety of places around the country, the tendency to refer to evolution as only a theory, and that's the tentative title of the book. As you know, book titles may change, and that title may change, as

Page 56

well. But the subtitle, I think, is more significant, and that is "Evolution and the Battle for America's Soul," and what I mean in this sense, as I will attempt to write in this manuscript, is not the soul in the spiritual sense but the soul in sort of a metaphorical sense, and that is I quite honestly think that America is the greatest scientific country in the world, that we have been uniquely hospitable to science. American society, if you will, has a scientific soul. It has science at its heart, and I think that comes from the practical and pragmatic character of the American people, the frontier experience, the idea of rebellion, which goes hand in hand with the founding of this country and the shaping of its institutions.
I am worried, as many scientists are, that the current battles over the teaching of evolution in schools may have far-reaching implications, and one of those far-reaching implications may be to drive a wedge between American people and young people in particular and science. In other words, that this is a battle that could cost this country what you might call metaphorically its scientific soul, and that is the point I will wish to make in

Page 57

this book and the argument that I will raise.
Q. Do you have any solutions?
A. Well, you're asking me about a book that I have yet to write. I think the solution to the problems as I see them are many. They include more effective scientific education and much more effective scientific communication to the general public from leaders in the scientific community.
Q. In the years that you've been addressing this issue, the controversy of teaching evolution, do you have any sense of whether the controversy is diminishing, increasing or just something that you couldn't even make a judgment about?
A. I think the controversy reached a high point in the early 1980s with the passage of creation science laws in two of the American states. I think at that point in time the scientific community very effectively communicated its message to the general public, and as you know, both of those laws were struck down by federal court decisions, one by a supreme court decision. And through the late 1980s and early 1990s, I think it's fair to say that opposition to evolution and the teaching of evolution ebbed, that it diminished.

THE UNITED STATES DISTRICT COURT
FOR THE MIDDLE DISTRICT OF PENNSYLVANIA

----------x

TAMMY KITZMILLER, et al.,

Plaintiffs,

v. CASE NO.: 04-2688
(Hon. Judge Jones)

DOVER AREA SCHOOL DISTRICT
and DOVER AREA SCHOOL DISTRICT
BOARD OF DIRECTORS,

Defendants.

----------x

Job No. 1658 Pages 1 - 358

DEPOSITION OF KENNETH R. MILLER, a witness called by counsel for the Defendants, taken pursuant to the Federal Rules of Civil Procedure before Dena M. O'Brien, CSR, and Notary Public in and for the State of Rhode Island, at Brown University, 171 Meeting Street, Room 212, Providence, Rhode Island,

on May 25, 2005, commencing at 9:00 a.m.

APPEARANCES:

ACLU
By Witold Walczak, Esquire
313 Atwood Street
Pittsburgh, PA 15213
(412) 681-7736

For the Plaintiffs

THOMAS MORE LAW CENTER
By Robert J. Muise, Esquire
24 Frank Lloyd Wright Drive
Ann Arbor, MI 48106
(734) 827-2001

For the Defendants

INDEX

WITNESS: PAGE

EXHIBITS

EXHIBITS (continued)

PROCEEDINGS

ROBERT J. MUISE,

a witness called for examination by counsel for the Defendants, being first duly sworn, was examined and testified as follows:

EXAMINATION

BY MR. MUISE:

Q. Good morning, sir. Could you just please state your full name and spell your last name for us.

A. Sure, my name is Kenneth Raymond Miller, and the last name is M-i-l-l-e-r.

Q. Good morning, sir. My name is Robert Muise, and I'm an attorney that represents the defendants in this case, the Dover Area School District and the Board of Supervisors, and we just met moments ago. I'm going to be asking you questions during the course of this deposition regarding that case, in particular your involvement as an expert witness. Do you understand that?

A. I understand.

Q. Sir, have you ever been deposed before?

A. No.

Q. My understanding is you have testified at

Page 58

In the mid 1990s -- and this is my unexpert historical analysis of recent American history -- the anti-evolution forces regrouped under a new banner, and that new banner was intelligent design, and in recent years, intelligent design advocates have done a very effective case of presenting their ideas to the public and winning some acceptance for them, and as a result, I think right now opposition to evolution is at a somewhat higher level than it has been in the past ten years. So it's been rising recently after falling before that.

Q. Now, you teach a basic biology course at Brown University, correct?

A. That's correct.

Q. It's Biology 20?

A. Yes, that is also correct.

Q. And I believe I've read somewhere that it's perhaps the most attended class at the university; is that correct?

A. In many semesters, it's the highest enrollment class at the university. Some years it's Econ 11, a basic economics course, but I think this past semester we had a higher role than Econ 11.

Page 59

Q. Do you find that when you're teaching students about evolution that they have an interest in this controversy that you were just describing?

A. Quite of few do. Many students --

MR. WALCZAK: I'm sorry. What's the controversy?

MR. MUISE: If there's something I say that you don't understand, then certainly we need to clarify. The controversy over teaching the theory of evolution, I mean certainly I could make it more narrow, if need be, but that is how I will present the controversy. The controversy regarding the teaching of the theory of evolution, which I believe is the preface to a question that you had answered.

MR. WALCZAK: The controversy is what? The controversy between evolution and intelligent design or the controversy about whether evolution has scientific support? I mean I'm not sure what the controversy is here.

MR. MUISE: Well, we could break it up into those components. First being the

Page 60

controversy of teaching intelligent design.

MR. WALCZAK: I'm sorry. Can you reask your question then with that definition of controversy?

BY MR. MUISE:

Q. As you've already testified to, you teach a basic biology class, Biology 20, at Brown University, correct?

A. I do.

Q. And the controversy over the teaching of evolution -- and I'll start with the controversy that's presented by intelligent design -- do your students have interest in that controversy? Have you experienced that?

A. I'm going to give you a complicated answer because I think you've conflated -- you put together several things in your question. My students certainly understand that within science, evolution is not a controversial idea. So to be perfectly honest, no student has ever come to me -- and this is in 25 years of teaching -- and asked me why I teach evolution and isn't evolution controversial and so forth.

Quite a few students have come to me,

Page 61

especially since on campus I am sometimes identified with the Roman Catholic chaplaincy, and ask me how I understand evolution on the basis of my religious beliefs. And again, that's not controversy. They just want to know how as a Catholic do you understand evolution.

Over the last couple of years a number of students have come to me -- not about controversy, but they've asked me what did I think of this idea called intelligent design, and those students I either answer their question directly or refer them to some of the articles or the book that I have written and say take a look at that and come back and we'll talk about it.

MR. MUISE: Mark this.

(Defendant's Exhibit No. 4 was marked.)

BY MR. MUISE:

Q. Sir, if you look at what I've presented in front of you that's marked as Exhibit 4, which should be a copy of your expert report that you provide in this case; is that correct?

A. Yes, that is correct.

Q. As you stated, you're providing expert -- your expertise in the field of cell biology, as well

Page 62

as science education. With regard to the expertise that you're providing, what was your specific assignment for this case?
A. I'm not sure that I understand.
Q. What is it this that you were asked to do with regard to providing your expert opinion?
A. Well, I was asked to talk a little bit about the way in which my textbook, the dragonfly book as you referred to it earlier, treats evolution. I was also asked to critique the statement prepared by the Dover Board of Education. I was asked to take a look at the book "Of Pandas and People," and I was also asked to write about the general scientific status of the theory of evolution and the concept of intelligent design.
Q. Anything else?
A. I don't think so.
Q. Does that report, which has been marked as Exhibit 4, does it contain a complete statement of the opinions that you intend to express and the basis for those opinions?
A. To the best of my ability at the time writing in a limited number of pages, yes, this is a fair exposition of my thoughts and views and

Page 63

analysis of the topics that we just outlined.
Q. Did anyone tell you that there was a page limit on these reports?
A. No.
Q. I don't understand your reference then to the limited number of pages?
A. Oh, well, the reference is probably more to limited time, limited energy and other duties. This is a lot to say about each of these topics, and given unlimited time and unlimited energy, yes, I could have gone on. So I'm not sure if you're asking me if I am called to testify at a trial I might have something else to say in addition to what's in here? The answer to that is yes, that's possible. But given, as I said, the time constraints of having these done by a date certain, this is fair exposition of my views and opinions on all of these issues.
Q. Have you or do you intend to prepare a supplemental report to this report?
A. I have not done so, and at least at this moment today, I have no plans to do so.
Q. And my understanding is you haven't submitted a rebuttal report; is that correct?

Page 64

A. That is correct.
Q. So that's the one document with regard to your opinions and the basis for them; is that correct?
A. That is correct.
Q. In the basic science course that you teach here at Brown University, do you ever mention intelligent design as part of your curriculum, your standard course?
A. A part of the curriculum or the standard course, the answer is no.
Q. Does it come up as a topic during the teaching of your class?
A. It does not come up as a topic during the teaching of the class, except as follows: And that is that I lecture three times a week, 50 minutes a shot, and lectures at a university course like this are -- there is no other way to describe it -- jam packed with information and material for students to cover.
I also provide students routinely in almost every lecture with supplementary material, including reading assignments in textbooks, things that are not assigned but they may be interested in

Page 65

if they wish to follow a particular subject further. And when I do give a couple of lectures on evolution, I do provide links to my students so they can look, for example, at some of the video clips from the PBS evolution series a couple of years ago which I appear, and in several of those I give my opinions on the scientific status of evolution, on the compatibility of evolution and science in general with religion, and I honestly can't remember if any of them deal with intelligent design or not, but they do deal with some of the challenges to evolution, but those are not part of the curriculum, not really discussed in lecture and not an assignment for any student in the class.
MR. MUISE: Mark that one.
(Defendant's Exhibit No. 5 was marked.)
BY MR. MUISE:
Q. Sir, you've been handed Exhibit 5. Could you just take a look at that and tell me if you recognize what that is?
A. Yes, this is a printout of my personal web page on the Brown University website.
Q. And it has various columns listed, which I believe provides links to further information. For

Page 66

example, Biology 20, that's the basic intro course that you teach, correct?
A. That is correct.
Q. And you have listed here as one of the primary topics, evolution; is that correct?
A. No, not the way you just said it.
Q. Okay.
A. You said listed as one of the primary topics in Bio 20 is evolution. No, listed as one of the web pages that I have composed, I do have a web page on evolution, but it's not specifically part of Bio 20.
Q. My question wasn't that accurate. I wasn't intending that to be part of Biology 20, but as one of the main topics of your web page, to be accurate?
A. That is correct.
MR. MUISE: Mark this Exhibit 6.
(Defendant's Exhibit No. 6 was marked.)
BY MR. MUISE:
Q. If you look at Exhibit 6, sir, do you recognize that?
A. Yes, I do.
Q. Are those the articles that would be

Page 67

referenced if you went from the link on Exhibit 5?
MR. WALCZAK: Which link?
MR. MUISE: Regarding evolution.
THE WITNESS: Yes, this is the web page that I maintain on evolution, and it's linked from my main web page.
BY MR. MUISE:
Q. Are these web pages considered to be resources for students or helpful for students or what's the purpose for doing these web pages and the links?
A. No, they are not primarily resources for students because although I provide links to my evolution web page as part of the supplementary material that I mentioned before in my course, they're not part of the curriculum per se. Because I have been publically involved in controversies over evolution, including debates on television, books, articles and opinion pieces and many people request copies of what I have written and even links of videos to my debates and so forth, I put all of this together into a single page that I can refer people to. So if they're interested in what I have said or what I have written on evolution, they can

Page 68

find those links on this one page.
Q. Do you at times refer students to those links?
A. When a student comes to me and asks question about evolution, I often say I maintain a web page, and there is it is, and if you wish to look it up, you certainly may.
MR. MUISE: Mark this.
(Defendant's Exhibit No. 7 was marked.)
BY MR. MUISE:
Q. I handed you Exhibit 7. Do you recognize what that is, sir?
A. Yes, I do recognize.
Q. And what is that?
A. This exhibit is a few -- not all – a few selected pages from the syllabus for Biology 20, a course that I taught this spring, 2005.
Q. Page two appears to be sort of a description of what the Biology 20 course is about. Is that what that is?
A. Page two is a description of the course.
Q. In the second full paragraph, the last sentence, it says, "The intention of this course is to establish the links between biology and other

Page 69

disciplines and to briefly explore some of the ways in which science is related to popular culture." Did I state that correctly?
A. Yes, you did read that correctly.
Q. Is that one of the goals of the course?
A. It is certainly one of the intentions of the course, and I should mention the fact that at many schools introductory biology courses are segregated: They are divided into courses for science concentrators and courses for nonscience concentrators. At Brown we don't do that. We try to keep our science and our nonscience concentrators together, and one of the effective ways that I have found in terms of tying in or heightening the interest of nonscience concentrators at the university level is to try to show ways in which the popular culture, as I said there, is affected by science.
Q. Since this is a basic course, you said you have nonscience specific with science specific students. Is that the term you used?
A. Well, the term that I used was concentrators. Now, our students don't have to declare their concentration, which at many schools

Page 70

we call them major. They don't have to declare their concentration until the end of their sophomore year, but students applying to the university usually indicate a preference as to whether they intend to go into the social sciences, the humanities or the natural science, and, if so, where do they go.

So I would say a large proportion of our students -- more than half -- by the time they take this course already would tell you quite freely whether they're going into science or whether they're not going into science. So they've already made up their minds.

Q. Well, the approach that you're taking in this basic biology class at the university level is that not similar to an approach that a school would take for a basic biology class in high school?

A. No, I think it's quite different, and it's different in a number of ways. The first way it's different is that at a university level one does not have a standardized state curriculum that has to be met, a set of state standards or state examinations that have to be prepared for. So that's difference number one.

Page 71

Difference number two -- and this is unique to Brown -- is that Brown does not have what other universities call general education requirements or core requirements or distribution requirements. To use an example from Pennsylvania, all students I am sure at Pennsylvania State University are required, for example, to take a life science course.

Well, no student at Brown is required to take any course in any area outside of their major field. We have what we sometimes call an open curriculum in that respect. If this were a required course and a ninth grade course in biology in high school is a required course for graduation in most states it would have to meet different standards. Because this is not a required course in that sense, the instructor has a great deal more latitude in trying to find ways to make biology interesting and relevant to students.

Q. Well, you wouldn't disagree, though, that the approach that you're taking Biology 20 satisfies a legitimate educational goal?

A. I would certainly agree that the approach that I take does satisfy a legitimate educational

Page 72

goal at the university level.

Q. And you don't believe, though, that that goal could transfer, as well, to a ninth grade biology class?

A. I think teaching at the secondary level and teaching at the university level is entirely different. In part because Brown is not a public school. It's a private institution of higher education, and in part because the maturity and the expectations of students and their educational background are really quite different.

Q. Do those distinctions that you've just described change the nature of the educational value of the goal that you're trying to seek in this Biology 20?

A. Change the goal from what?

Q. Well, you were describing how you believe education at the university level for this basic biology class and education at the ninth grade high school level is different. You referred to the maturity of the students as an example, private university as opposed to a public university as an example. With regard to specifically the educational goal that is addressed in that sentence

Page 73

that we read from the exhibit of the intention of the course, does that change the nature of that goal as to whether or not it's a legitimate educational goal or not a legitimate educational goal?

MR. WALCZAK: I'm lost on the goal.

THE WITNESS: Me, too. When you say change the goal, change it from what?

BY MR. MUISE:

Q. Well, we focused -- and let's just back up looking at your Biology 20, and you described the intention of the course to establish links between biology and other disciplines and to briefly explore some of the ways in which science is related to popular culture. Did I state that correctly?

A. Yes, you did state that correctly.

Q. And I had asked you if you believe that was a legitimate educational goal, and I believe you stated yes, it was?

A. Yes, I do believe it's a legitimate educational goal for this course at this university at the university level.

Q. And that goal -- are you saying then that goal applied to the ninth grade biology class is not a legitimate educational goal if a biology course

Page 74

was going to have that as an educational goal?
A. I think the situation teaching at the secondary level, specifically the ninth grade level, is really quite different, and I think that the goals -- and I know this from experience from my own interactions with high school teachers -- that the goals that they set for their courses because of state requirements and examinations and also the fact that these courses are required of all students and the maturity level of a 14-year-old is not the same as the maturity level of an 18-year-old, that different sets of goals have to be put together, and as a result rather than say it's not a legitimate goal, which is the question that you asked me about, I would say that the goals of courses at the ninth grade level have to be quite different because of the individual circumstances, and I have never taught myself a ninth grade biology class.
I've written a book that provides resource material to a teacher, but teachers use textbooks not as curricula but as resource material from which to derive their curricula, and having never taught at that level I'm going to have to beg off the question because I do know that the situation is

Page 75

different, but I am not an expert in the day-to-day classroom and laboratory teaching of ninth grade students.
MR. MUISE: Let's mark these together as one exhibit, if you could do that.
(Defendant's Exhibit No. 8 was marked.)
MR. WALCZAK: Is that marked as one exhibit?
MR. MUISE: Yes, it's marked as Exhibit 8.
BY MR. MUISE:
Q. And what I understand Exhibit 8 to be is it's week two and week three of your basic Biology 20 course, the curriculum for those two weeks; is that correct?
A. These are printouts of the web pages that accompany those two weeks of the course; that is correct.
Q. During that basic biology course, how much of that course is dedicated to teaching the theory of evolution?
A. Well, let's see. I gave a lecture on Friday, February 4th -- or actually, I remember I was away that day, and Dr. David Rand gave a guest lecture introducing the topic of evolution. Then on

Page 76

Monday, February 7th, I was back in town, and I gave a second lecture on evolution, and then on Wednesday, February 9th, I gave a lecture entitled, "The Selfish Gene," which is a title of a book by Richard Dawkins that deals with the evolution of genes that promotes social behavior. So adding those three up I would say three lectures that deal with evolution in one sense or another.
Q. How many lecture days are covered in this course?
A. It varies from year to year, and I'd actually have to look at the syllabus and count them up, but I think just under 40, like 37, 38, 39, thereabouts.
Q. So approximately three lectures out of approximately 38 to 40 lectures are covering evolution specifically?
A. That is correct.
Q. And I believe from your prior testimony -- and I think it's referenced on Exhibit 8 -- that you make references on those curriculum pages to outside materials addressing the evolution controversy; is that correct?
A. Outside materials addressing the

Page 77

evolutionary controversy? Well, I will say yes to only one of the outside materials that I can see, and that is I provided on Friday, February 4th -- that was Dr. Rand's lecture -- links to three video clips that were part of the PBS series on evolution. One of them is called "Who was Darwin?" Another one was called "How Do We Know That Evolution Happens?" The third one is "Why is Evolution Controversial?"
Now, that's not the same as your question. You said the controversy over evolution but rather, why is evolution controversial, and I think those two different ways of phrasing it have slightly but important differences in meaning.
Q. What was the title of the lecture that was given, those items that you just referred to, made reference to or were provided as supplemental references?
A. The title of the lecture was Evolution Lecture One.
Q. What was the purpose of providing those -- I believe you said there were three videos; is that correct?
A. That is correct.
Q. What was the purpose of providing those

Page 78

three videos?
A. The purpose of providing those three videos was to allow students to explore supplemental information relating to the lecture topic, and as I'm sure you can see from looking at the other lectures topics in the printout, I do this sort of thing frequently with lectures.
Q. What educational goal is promoted by showing a video "Why is Evolution Controversial?"
A. I don't quite understand the question because I didn't show the video. You said what educational goals were promoted by showing the video? I didn't show the video.
Q. Well, how about what educational goal is promoted by providing students access to the video "Why is Evolution Controversial?"
A. To give students an opportunity to explore other aspects of evolution and evolutionary theory.
Q. What other aspects?
A. The way in which evolution is regarded in the larger society, for example.
Q. What goal does that promote?
A. I think I've already answered the question, which is to give students an opportunity

Page 79

to explore the implications of some of the material that we cover in lecture and, you know, the generalization that I would apply to any education is the goal is not to define a set of material to be mastered but to open a door, and this is one way to open the door and say if you want to walk through this door and take a look, there it is.
THE WITNESS: Time to take a break?
MR. MUISE: It is. Why don't we take a ten-minute break?
(Recess.)
BY MR. MUISE:
Q. Dr. Miller, you've debated the status of intelligent design and the evolution -- the controversy over teaching the evolution with people such as Professor Behe and Professor Dembski; is that correct?
A. That is correct.
Q. If you could and as best as you can recall the -- run through a list of where these debates took place, and then I'll do some follow-ups from there.
A. How far back do you want me to go?
Q. How far back does it go?

Page 80

A. My first debate on this subject took place in April of 1981 here on the campus of Brown University, and it was against Henry Morris, the president and director of the Institute for Creation Research. The next year I also debated Henry Morris at a high school auditorium in Tampa, Florida. That's probably 1982.
Q. Let me -- and I apologize for interrupting. With regard to -- let's just, I guess, focus on intelligent design. You mentioned Henry Morris --
A. Well, the interesting thing, however, is that many of the arguments that were raised by Henry Morris and were raised later on by Dwayne Gish, also from the Institute of Creation Research, spoke quite specifically to the argument that living things and the systems within living things had been intelligently designed.
So even though they did not refer to their ideas as the intelligent design movement or the intelligent design hypothesis, a central contention of these folks who would characterize themselves as creation scientists was that life and the components of living things were, in fact, intelligently

Page 81

designed. So that's why I immediately went back to the debate with Morris.
I can make this turn for you, if you like. Between 1981 and 1983, I debated Henry Morris and Dwayne Gish in various locations I think a total of five times.
Q. Were any of those at universities?
A. The first one was at Brown University, the second one I mentioned was at Tampa, the third one was also at Tampa, Florida. These were at public school auditoriums, and there was -- it might have been my final debate -- at the University of Arizona, and in that debate I and a fellow from Evergreen State College in Washington named David Milne, M-i-l-n-e, debates Henry Morris and David Gish in tandem. I think there was a fifth one, but I can't quite remember.
Q. The ones that you just described were they debates where students were invited to attend?
A. Oh, yes.
Q. Were the debates hosted by the universities or the public schools in question where they took place?
A. Yes.

Page 82

Q. Was there a next series of debates that you were involved in?
A. Now, pardon my hesitancy. I haven't been asked for a specific listing of these before, and therefore, I'm trying to put this together.
Q. I understand.
A. I think the next debate-like encounter that I was involved in was in 1996 when the Nova series on PBS produced a series of programs called "The Odyssey of Life," and they were assembling a website to supplement the program and asked if I would engage in a series of written debates that would take the form of an exchange of letters with Phillip Johnson, and I agreed to do that, and Phillip Johnson and I posted four letters each I think limited to 500 words on the Nova website for the Odyssey of Life, and those letters are still there. The website still exists.
The first live debate since that little flurry in the early 1980s that I participated in, after that point was in December of 1997, and I was invited to come on the television program Firing Line hosted by William F. Buckley. Firing Line, as you know, was a 30-minute or so discussion program

Page 83

usually in which Mr. Buckley would interview and occasionally cross-examine someone from arts, politics, culture and so forth.
But every now and then Firing Line would have a very formal debate program that would last in the neighborhood of 90 minutes for which there was a formal moderator and a formal proposition, and I was invited to be one of four people who spoke on behalf of evolution. We were opposed by four people who spoke against evolution, and the proposition for the debate -- and Mr. Buckley, of course, was always very formal about these things -- was resolved: "The Evolutionists Should Acknowledge Creation." You look at me saying what exactly does that mean? Well, yes, that's right, and I think that was Mr. Buckley's style was to be deliberately ambiguous and provocative in setting up debates.
Q. Who were some of the people on the other side of the --
A. The debate was moderated by Michael Kinsley, who's the writer for Slate. I think he's a newspaper columnist. The people on the side of Acknowledge Creation were Phillip Johnson, Michael Behe, David Berlinski and William F. Buckley.

Page 84

Q. And what was the next debate, if there was another one?
A. I'm going to have difficulty getting this chronologically right. I can go back and pull out my old calendar books and get this right, but I'll try to give you a few in more or less order. Michael Behe and I have debated the issue of intelligent design -- oh, excuse me, I left one very important one out. Sorry, not intentional. Again, I haven't been asked for this before.
In the summer of 1995, I was asked by an organization called the American Scientific Affiliation to come to their summer meeting in North Carolina and debate the adequacy of a textbook called "Of Pandas and People" for use in the public schools, and I was told that the debate would be moderated by someone I had never heard of -- his name is Paul Nelson -- and that taking the affirmative that Pandas was a good book to use in public schools would be a Lehigh University biochemist named Michael Behe.
That was the first time I heard of Dr. Behe, and at that meeting we debated the issue of "Pandas and People," and much to my surprise the

Page 85

moderator, Paul Nelson, did not turn out to be a moderator. He turned out to be someone who valiantly said I can't moderate this. I have to take Dr. Behe's side. So it was a one-on-two debate.
Q. Where did this take place?
A. It was in North Carolina. I'm tempted to say Asheville, but I don't think it was Asheville.
Q. Was it at a university or a school setting?
A. It was at a small liberal arts university, and I apologize again. Not having been asked for this information in advance, I can't remember the name of the place. So that was the first time I debated to Dr. Behe. Since then he and I have debated on public radio. These are brief debates, of course, five or ten minutes, on a program called Science Friday and once or twice on public affairs programs, local public affairs programs run by public radio stations in several places around the country. I think one is in Kansas, and more recently this past year once on a Philadelphia radio station, as well.
In addition, Dr. Behe and I at a

Page 86

1 conference at Haverford College in I would say 2002
2 gave debate style 30-minute presentations. I
3 believe it was first Dr. Behe and then myself.
4 Those presentations were videotaped and actually are
5 available now on the worldwide web in screaming
6 video. I also debated Dr. Behe and Dr. Minnich,
7 Scott Minnich, at our presentations at the
8 conference that I mentioned before at Concordia
9 College in Wisconsin.
10 In the summer, I believe, of 2003, I
11 debated William Dembski and Paul Nelson at the
12 annual meeting of the American Sceptics Society in
13 Los Angeles. In either 2002 or 2003, Robert Penick
14 and I debated William Dembski and Robert Behe at the
15 American Museum of Natural History in New York.
16 And, you know, I might have missed one or two in
17 there, but those are the ones that I remember well.
18 Q. And obviously, we looked at your CV
19 previously, and there was the book that was edited
20 by Michael Ruse and William Dembski in which you
21 provided an article disputing the scientific
22 validity of irreducible complexity; would that be an
23 accurate --
24 A. That is an accurate description.

Page 87

1 Q. In that book I believe Professor Behe
2 would have presented a paper describing the
3 scientific validity of the concept of irreducible
4 complexity with which you were responding to?
5 A. No, that's not quite right. We were all
6 asked to submit essays. So I certainly did not see
7 his essay in advance. So I have nothing to respond
8 to, and I don't know if he saw my essay in advance
9 or not.
10 Q. Okay. So it wasn't set up as a you write
11 on this topic and then somebody is going to respond.
12 It was just asking for contributions to this book?
13 A. That is correct.
14 Q. Any other books in which you contributed
15 writings to debate the scientific validity of
16 intelligent design?
17 A. Yes, and they're on my CV, and I'd be glad
18 to point them out to you.
19 Q. If you could, please. Thank you.
20 A. You might note that in 2003, I published
21 an article in a similar book edited by Neil Manson
22 called "God and Design," and the title of the
23 article -- and I think this title is correct – this
24 is Miller K.R.(2003) under essays and review was

Page 88

1 "Answering the Biochemical Argument from Design."
2 The year prior to that I wrote a one-page
3 article for Natural History Magazine called "The
4 Flaw in the Mousetrap," and this issue of natural
5 history was a debate format in the sense that
6 Michael Behe was invited to contribute a one-page
7 essay, which I did read and then responded to in a
8 one-page essay.
9 In 1994 when the term intelligent design
10 was just beginning to be used by those who were
11 critical of the teaching of evolution, I wrote an
12 article called "Life's Grand Design" that was
13 published by MIT and Technology Review Magazine.
14 And that also dealt with some aspects of the
15 intelligent design argument. Although you'll note
16 the date 1994. That is prior to the appearance of
17 Dr. Behe's book and prior to what I might call the
18 current intelligent design movement that's
19 spearheaded by the Discovery Institute in Seattle.
20 Q. Natural history where "The Flaw in the
21 Mousetrap" appeared, is natural history considered a
22 science publication?
23 A. That depends. Natural history at the time
24 was the official publication of the American Museum

Page 89

1 of Natural History, and even though articles that go
2 into Natural History Magazine are peer reviewed in
3 the sense that they're sent out for scientific
4 review, they're really intended more for a general
5 audience than for a scientific audience.
6 So if you were, for example, to walk into
7 our university library, you would probably find
8 natural history in the section of the library
9 reserved for scientific journals, but you could
10 certainly make a quite reasonable case saying that
11 it really is a magazine publication for members of
12 the general public who have an interest in science.
13 Q. How about any of the other places where
14 these articles were published? You just described
15 natural history. Any of those articles that you
16 just reviewed for me, any of those appear in what
17 you would consider to be science publications?
18 MR. WALCZAK: How do you define science
19 publications?
20 BY MR. MUISE:
21 Q. Are certain things considered science
22 publications and some things not? Is that a term
23 you would use?
24 A. I think the term that I would use would

Page 90

be scientific journal rather than science publication.
Q. Okay.
A. And the answer to this, unless I'm missing something, is no, which Technology Review is, once again, it's a magazine for alumni and other people associated with MIT. It's a magazine intended for the scientifically literate individual, but it's not really a scientific journal.
The same would be true with natural history. The same would probably -- you could make the same statement, for example, about Scientific American. There's no question that Scientific American is a scientific publication in the sense that it is about science, but it's not considered a scientific journal in the sense that you don't publish original scientific observations in it.
I should add as with all things where one looks for hard and fast definitions here, it's quite easy to blur the line between what is a scientific journal and what is a journalistic publication about science.
Q. Now, I believe you also wrote a book review of Michael Behe's book, "Darwin's Black Box";

Page 91

is that correct?
A. Yes.
Q. And where does that appear on your CV?
A. Gee, I don't know if it does. I don't see it right away, and I would assume that if you had analyzed my CV, you'd point out to me where it was. So perhaps I did not include it.
Q. You, in fact, did that, though?
A. Oh, in fact, I did. That's right. And that review -- when I published it, I placed it in two places. One is I placed it on the web. So it is up and available on the internet. You can find it through the web page, the very one that you referenced in Exhibit 6, and also, it was published in a small journal called -- I think called "Creation and Evolution" or something along those lines that has a very, very small circulation and is not really considered a scientific journal.
Q. In these publications and debates refuting this concept of irreducible complexity, in doing so are you making reference to the scientific literature?
A. Yes.
Q. Now, I take it from what you've written

Page 92

and obviously in your report that you do not consider intelligent design theory to be science; is that correct?
A. As I understand it and as I have read explanations of the idea of intelligent design, I don't think it meets the standards required of a scientific theory.
Q. Tell me what your -- the definition of intelligent design that you're using for purposes of your report and your opinion?
A. Intelligent design is a term that can be applied on several levels, and one of the things that I have tried to make clear is that in the most general since the term intelligent design might be construed to mean that there is an intelligence to the universe, that we live in a universe where things make sense, that there seems to be a sense of purpose and meaning to the universe, and in that respect, any person who is a theist, any person who believes in God you might say, believes that there is an intelligent design to nature and to life.
But in the context in which intelligent design is being used in the Dover case, the context to which it is being referred to in the statement by

Page 93

the Dover Board and the context in which intelligent design is used by the Discovery Institute and in the book "Of Pandas and People," intelligent design is the proposition that the basic mechanism of evolution does not work and that the complexity of life, the changes that appear in living things in natural history and the organization of living things are all best explained by the actions of an intelligent creative force acting outside and you might say above -- acting outside of the natural world, and that by definition that creative force lies outside of scientific explanation.
That's my understanding of what the term intelligent design actually means in the context of this case.
Q. I'm going to have some follow-up questions on that, but let me ask you this question: Could you define for me -- we hear the term creationism used quite often. Define for me what creationism means?
A. That's a very important question, and I'm going to have to answer it very carefully. In the ordinary meaning of the word, a creationist would simply be any person who believes in an act of

Page 94

creation, and as I mentioned earlier, I'm a Roman Catholic. Therefore, I believe that the universe was created by God, and in a sense that would make me a creationist since I like I think any Christian or for that matter any person who follows any of the Abrahamic religions, Islam, Judaism and Christianity is a creationist in that they believe that there's a single God who brought the universe into existence.

In the current context, however of debate and discussion in the United States, creationist could have a number -- I'm sorry. I shouldn't say that. The word creationist does have a number of other quite different meanings apart from the very broad and general one that I just gave you, and in common everyday usage, the word creationist is sometimes used to refer quite specifically to a young earth creationist.

Now, a more precise term for that might be creation science, and I say that because, of course, the tenants of creation science were defined in the creation science laws that were passed by two American states in the early 1980s, and those tenants include the notion that the earth is young, only 6,000 to 10,000 years old, that all living

Page 95

things extinct or alive today were created during a single six-day creation period, that the entire geological pattern of this planet reflects not the geological ages but rather deposition in a single 40-day, 40-night worldwide flood, that the mechanism of evolution simply does not work, and finally, that human beings and apes have separate ancestry. To the best of my recollection, those were the basic principles that were articulated in the creation science laws that were passed in Arkansas and Louisiana in the early 1980s.

So one meaning of the word creationist would include that specific set of beliefs and principles that I just outlined. There is, however, another way in which the word creationist can be understood, and that other way, a more general way -- it would be sort of in between the two extremes that I've just given you -- is a person who believes that specific creative acts at various times in the history of this planet took place and are, in fact, required to explain the complexity of life and the appearance of new species on this planet.

Now, as you know, the intelligent design

Page 96

movement avoids the use of the word creation, and they prefer to say that they see evidence of design, but the interesting thing about the use of the term design is that if the bacterial flagellum had only been designed, it wouldn't exist. In order to come into existence, it had to be created. If the animals that appeared during the Cambrian period had only been designed, they also would not exist. They must have also have been created.

So my understanding of the idea of intelligent design is that in proposing that living organisms, species, biochemical structures and major innovations in life history are the work of a designer. What the intelligent design movement is actually proposing is a series of creation events scattered over the history of life on earth that amounts to what could most accurately and properly be called progressive creationism. So in that respect, I think the word creationist can be fairly and appropriately applied to the idea of intelligent design.

Q. You said there proposing a series of creation events scattered over life. What are the particular series?

Page 97

A. Well, I think to -- I think to list the series of events what one needs to do is to go to the literature of intelligent design. So I'll give you an example. Professor Behe proposes that the bacterial flagellum was intelligently designed. Professor Behe proposes that the bacterial flagellum was intelligently designed. Well, bacteria possessing flagellum, as far as the fossil record indicates, first appeared a little more than a billion years ago. So that would mean that the intelligent designer must have engineered a creative act to bring those bacteria with those flagella into existence at that time.

Professor Behe also proposes that the eukaryotic cilium -- that's c-i-l-i-u-m -- was intelligently designed, and the fossil record indicates that eukaryotic cells with cilia didn't appear until more recently than a billion years ago. So to me that would mean that he proposes a creative act by the intelligent designer to create the eukaryotic cilium at that time.

Dr. Behe -- I'm sorry. I shouldn't attribute this to Dr. Behe, but other members of the intelligent design movement, notably Stephen

Page 98

Meyer -- Stephen Meyer and Dr. Jonathan Wells have proposed that the animals that appear in the so-called Cambrian explosion were, in fact, examples of intelligent design, and what that must mean quite logically is that every single one of those organisms that appeared during the Cambrian period must have been the result of separate and distinct creative acts on the part of the intelligent designer.

Dr. Behe has also proposed that the vertebrate blood clotting system is an example of intelligent design since the vertebrate blood clotting system, as far as we know, first appeared 450 million years ago, that must also mean that at that point the intelligent designer produced a series of creative acts at the level of biochemistry to create the blood clotting system, all of its regulatory factor and all of the genes which code for the various components of its system. So when I say a series of separate and distinct creative acts, the creative acts I'm citing are the very ones that are proposed to have taken place at various times by members of the intelligent design movement.

Q. And the purpose for my asking the

Page 99

question, the separate created acts, you're obviously not referring to the six days as referenced in the Book of Genesis, correct?

A. No, I'm not; that's correct.

Q. I'm going to go back to the definition you provided for creation science, and I know you said it's important to be accurate about the definitions that we're using with regard to creationism; is that fair?

A. I think it is fair to say that it is important to be accurate about the definitions, and I also -- I hope I said this properly. I also said that creation science can also be referred to as young earth creationism to sort of distinguish that from the kind of progressive creationism which I just described as being part of the intelligent design movement.

Q. Now, with regard to those tenants that you outlined for creation science, and I have listed here five various tenants. The first one you said the earth is 6,000 to 10,000 years old; is that correct?

A. That's what I said, yes.

Q. And intelligent design doesn't adhere to

Page 100

that tenant; is that correct?

A. Well, my own reading of the intelligent design literature is that intelligent design as it is -- the idea of intelligent design as it is expounded by members of the movement is silent on the issue of the age of the earth, and, in fact, during the debate at the American Museum of Natural History that I told you about before, in which Robert Penick and I were debating Robert Behe and Michael Dembski, we tried -- and the debate transcript which is freely available on the web will show this. We tried really, really hard to get William Dembski to say anything about what he thinks the age of the earth is, and rather than say, as he might have, that the earth is probably four and a half billion years old that geologists say it is, he stubbornly refused -- I shouldn't say stubbornly. He simply refused to answer the question and said it was not relevant to the idea of intelligent design.

So my own reading of intelligent design advocates is that they neither -- that they very carefully refuse to take a position on the age of the earth for the most part.

Q. In the literature defending the position

Page 101

of intelligent design, they often refer to the Cambrian explosion; is that correct?

A. Yes, they do.

Q. When did the Cambrian explosion occur?

A. I'm not an expert in paleontology, as I made clear, but my own reading of the paleontological literature is the Cambrian period and the events, the evolutionary events referred to as the Cambrian explosion, took place over 15 to 25 million years during a period of time approximately 530 to 550 million years ago.

Q. You would not suspect then that a person who adheres to the young earth creationist tenant that you referred to would not reference an event in history which at least demonstrates that the Earth is over 500 million years old?

A. No, I would not expect that, and I can say that from experience, and that is that in my debates with young earth creationists in the early 1980s, I found them eager and quite willing to take on the issue of the Cambrian explosion, and, in fact, the current literature written by intelligent design advocates in terms of the arguments it makes about the Cambrian explosion is remarkably similar to the

Page 102

literature written by young earth creationists, and the strategy that young earth creationists often use is to say well, we don't accept the system of geological ages, which places the Cambrian at 540 million years ago. However, just to show that evolution is wrong, we will accept those dates, we will accept those fossils, and now we will attack them on your terms, meaning on the terms of an evolutionist.

So young earth creationists often make use of the Cambrian explosion. They criticize it quite frequently and the criticisms by intelligent design folks are really quite similar to the ones made my young earth creationists.

Q. Is it your view then that intelligent design theorists don't accept the period of time that the Cambrian explosion occurred, the 530 million year period of time?

A. You asked me to generalize about intelligent design theorists. From personal experience I can name one of the senior fellows at the Discovery Institute who is an intelligent design advocate, who does indeed, as he himself described, takes a young earth view, and that is Paul Nelson.

Page 103

In the debate at the Sceptic Society under repeated questioning by myself and Wesley Elsberry, who was the other evolutionist debating in front of it Paul Nelson got up and said yes, it is no secret that I take a young earth view. So some advocates of intelligent design do indeed accept the idea that the earth is young, 6,000 to 10,000 years old. Others -- Michael Behe would be a good example -- say that they have no reason to dispute the information they get from geology that the earth is very old.

The official, if you want to call it that, position of intelligent design advocates -- and when I say official, I'm usually referring to the Discovery Institute -- is to maintain a kind of indifference to the age of the earth that says intelligent design -- and this is the position that William Dembski took in the natural history debate. Intelligent design makes no statement and no claim about the age of the earth because it's not part of intelligent design theory.

Q. Using Michael Behe then as an example, it's not required then for an advocate of intelligent design to adhere to a young earth view?

Page 104

A. It is certainly possible for a progressive creationist to say that these individual acts of design, these individual acts of special creation took place over many billions of years, and my own understanding of Professor Behe's views on this is that that is exactly what he maintains.

Q. With that being said, is it accurate to say that the age of the earth is not a required tenant of intelligent design?

A. The way in which I would phrase it is advocates of intelligent design tend to sidestep the issue of the age of the earth in favor of simply arguing for the existence and the creative activity of the designer.

Q. Comparing the creation science definition that you gave and the intelligent design definition that you likewise gave, does the age of the earth play a similar role in both of those definitions?

A. Can you restate that a little bit? I didn't quite follow it.

Q. Well, I mean you've listed that as one of the particular tenants of creation science.

A. Yes.

Q. My understanding from your testimony is

Page 105

you're saying that to be an advocate of intelligent design, you're sidestepping that tenant?

A. That is exactly what I said.

Q. But is it necessary for you to hold to that tenant to be an ID advocate?

A. What I said was that it is entirely possible to argue for progressive creation spread over great expanses of time, as indeed most intelligent design advocates do.

Q. So for those intelligent design advocates, they don't adhere to the young earth tenant?

A. I think what you're saying is that intelligent design advocates who think the earth is old, think the earth is old, and I agree. The only individual example I can think of who has made clear of his acceptance of the great age of the earth is, in fact, Dr. Behe, and as I mentioned, the intelligent design advocate Paul Nelson has made it clear that he thinks the earth is young, and in my one experience in person in debate with William Dembski, William Dembski refused to say whether he thought the earth was old or young and said it was an irrelevant question for the issue of design.

Q. And those that you put in the category of

Page 106

creation science, would it be accurate to say that they would be unequivocal in terms of their view on the age of the earth?

A. Individuals who are young earth creationists – the particular point of view that I identified is creation science. Yes, they are completely unequivocal that the earth has to be between 6,000 and 10,000 years old.

Q. Now, the second tenant of creation science that you identified was that all living things were created during a single six-day creation period?

A. That is correct.

Q. And I believe that's most often the reference to the Book of Genesis?

A. That's my understanding, too.

Q. Is it your understanding that creation science looks at the Book of Genesis, interprets that literally and then attempts to provide evidence to support what's in the Book of Genesis?

A. Not exactly. The personal contact that I have had with advocates of what I have defined today as creation science does indeed argue as an element of religious faith that Genesis is just as you said, literally true. However, the people who call

Page 107

themselves creation scientists also argue that that view that the earth is indeed young can be arrived at independently through scientific evidence and scientific investigation.

So they argue that there is independent scientific evidence that confirms the young age for the earth and the simultaneous creation of all living things or near simultaneous creation of all living things.

Q. Do advocates of intelligent design hold to that tenant?

A. My own understanding is that not all advocates of intelligent design hold to that tenant and many – and Dr. Behe is a good example, and I keep bringing his name up simply because I've had a lot of personal contact with Dr. Behe and I think I know his views on this. I believe that Dr. Behe would argue that living things by-in-large, especially new examples of organisms, founding members of the animal phyla, for example, and so forth were indeed created in separate acts of creation by the intelligent designer but that those acts were spread over geologic time, which is to say over hundreds of millions or billions of years.

Page 108

Q. Would it be fair to characterize or to summarize what you just stated that he does not adhere to the literal Genesis six-day creation in terms of his description of what's created on what days?

A. Speaking specifically about Dr. Behe, the answer is yes.

Q. So, again, in summary then an ID advocate need not necessarily hold to that second tenant of creation science that you identified?

A. Yes, that is correct, and as I mentioned, a progressive creationist, which is what I think most intelligent design advocates are, could argue that these creational design events were spread over hundreds of millions of years.

Q. The third tenant of creation science that you referred to regarding the entire geological patent flood geology -- I'm not sure if there's a specific term for that tenant. If there's a way you could describe that third tenant. Is there a particular name for it, flood geology? Is that the term that they use?

A. The answer is yes, and flood geology is a term that I believe was first coined by Henry Morris

Page 109

of the Institute for Creation Research to describe the notion that the geological ages which students, for example, study in earth science classes are actually an illusion and that all of the strata of the geological ages were indeed deposited in a single worldwide flood, and that is sometimes called flood geology.

Q. To be an advocate of intelligent design, is it your understanding that they have to adhere to that tenant?

A. With respect to individual intelligent design advocates, Paul Nelson of the Discovery Institute who makes clear that he is a young earth creationist may very well hold to that particular point of view. Dr. Behe, the counterexample I keep bringing up, has made it clear that he does not hold to that point of view.

So the answer is yes, it is possible to argue as intelligent design advocates for a series of progressive creation or design events spread over time and still accept the geological record as valid.

Q. Now, the fourth tenant you described as the mechanism of evolution does not work. Did I

Page 110

state that correctly?
A. I'm sure that's how I said it.
Q. And the mechanism you're referring to, is that natural selection?
A. It is the mechanism of genetic change that includes mutation, recombination and natural selection.
MR. MUISE: Could you read back all three to me, if you could?
(The question was read by the reporter.)
BY MR. MUISE:
Q. Is this a tenant that ID advocates -- and when I refer to ID, you understand I mean intelligent design advocates?
A. Of course.
Q. Is that a tenant that ID advocates adhere to?
A. Yes.
Q. Are there scientists who you would not consider to be ID advocates who would refute that the mechanism of evolution as you describe mutation, recombination and natural selection does the work that it claims to do?
A. I'm going to answer that question in a

Page 111

complicated way because what I ended up doing when I answered your question about that point was suddenly listing a series of things that go into the mechanism of evolution, and I want to make it clear that when I made that list that was not an exhaustive list.
There are many elements, many mechanisms that go into what we understand today as the evolutionary mechanism. Now, you just asked me are there any scientists, any people who I would consider scientifically reputable who don't think that the mechanism as I just described is the whole story, and my answer to that is yes, and one of those people was Charles Darwin, and Darwin, in fact, wrote -- and I can produce some of the correspondence -- that he had always insisted that natural selection was not the sole driving force behind evolution, that there were likely many other mechanisms at work, but people have misread his work, and he hopes that they will read his work more carefully when he emphasizes that natural selection in his view is the main but not the sole driving force behind evolution.
So I'm sorry the answer is long, but the

Page 112

question is important, and the question is complex. There are many mechanisms, especially at the molecular and biochemical level, that can be responsible for evolution and for evolutionary change, and as we learn more about the machinery of gene expression, we discover more of these mechanisms all the time.
Now, it's entirely possible to answer your question and give a misleading impression. What I mean by that is to say yes, there are many scientists who think that Darwin's original formulation of the mechanism of evolution was either incorrect or incomplete on the basis of much better current information on how genetics, molecular biology and what we call adaptation actually works.
So, yes, there are lots of people who would dispute that that is the sole mechanism. The nature of those disputes still fall I would argue within the framework of what we consider to be evolutionary change today.
Q. And I appreciate the complexity of the answer. Let me try to bring it back, and if this doesn't fit, then obviously, I'll expect you to correct me on this. The tenant you described as

Page 113

mechanism of evolution does not work, and you explained in further detail the nature of the mechanism -- the nature of -- the variation of the mechanisms operating in evolution.
But the general statement that you gave, mechanism of evolution does not work, would it be fair to say that that is a tenant that is held not only by creation science advocates, intelligent design advocates but others as you would describe as reputable scientists?
A. Not exactly. I think the best way to describe the disputes over evolutionary mechanisms is to examine what common principles are shared by creation science advocates and intelligent design advocates, and the common principles that are indeed shared is that the natural, observable, testable mechanisms of genetic change over time are not sufficient to produce the changes that evolution requires, and I think that's the point on which these two are united.
Now, in discussion of this issue, it is possible to bring in the opinions of many scientists who say that Darwin's ideas about evolutionary change were inadequate on the basis of current

Page 114

discoveries relating to genetic recombination, transposable genetic elements, regulatory genes and developmental patterns.

Therefore, Darwin's ideas need to be updated in view of current discoveries, but these scientific criticisms of evolution would in general not dispute the idea that the mechanisms of evolutionary change once fully understood at the natural level are still sufficient to bring about the change that the evolutionary process requires.

Q. This last tenant, humans and apes have separate ancestry, is that a tenant that ID advocates adhere to?

A. In general, yes, it is. I can't produce the reference immediately, although I can find it, but I know that William Dembski wrote a piece that circulated and appeared on his internet website arguing that intelligent design, the intervention of the outside creative force was required to explain how and why humans are different from the great apes, and in that respect if creative intervention is required, to me that means separate ancestry.

So, in general, I think that is true.

Now, there are some individual exceptions, and we

Page 115

have already in our discussions here explored some of the individual difference among various members of the intelligent design movement, and during our debate in North Carolina in 1995, for example, Professor Behe said he had no problem acknowledging that our species shares a common ancestry with the other great apes.

So, once again, Dr. Behe is very clear on that point, but I think it's fair to say that most intelligent design advocates -- and I would include among these Paul Nelson, William Dembski, Phillip Johnson and Jonathan Wells are critical of the evolutionary story of human ancestry.

Q. What's Paul Nelson's background? Is he a scientist?

A. Well, he is a senior fellow at the Discovery Institute. I don't have Paul Nelson's CV in front of me. My understanding is that he has a degree in philosophy from the University of Chicago. I don't know what his scientific training or background is, but he certainly has been prominent and outspoken as an advocate of intelligent design.

Q. Then again, using your Professor Behe example, it's not necessary for an ID advocate to

Page 116

hold to that fifth tenant; is that accurate?

A. It is possible for an intelligent design, a progressive intelligent design advocate, a progressive creationist to accept the notion that human beings and apes have common ancestry, but my own personal observation is that most advocates of intelligent design do hold to the tenant that humans and apes have separate ancestors.

Q. When you were listing these five tenants of creation science in your definition of creation science, were they principles that were uniformly adhered to by those who consider themselves to be creation scientists or creation science advocates of that particular theory?

A. My own personal understanding and observation is for the most part, yes. Members, for example -- to become a member of the Institute For Creation Research my understanding is that you have to sign a pledge that adheres to all of those points.

Q. And then that is not the case, though, for intelligent design advocates based on your prior testimony?

A. My own understanding is that one does not

Page 117

have to sign a pledge to become a member -- to become known as an intelligent design advocate. But as I mentioned, intelligent design advocates hold several of those points in common with young earth creationists, and in particular all intelligent design advocates that I'm aware of because it's part of the theory of intelligent -- or the hypothesis of intelligent design hold to the view that progressive creationists or design events have occurred throughout the history of life on this planet.

Q. Now, you answered my question with regard to the pledge stating that you're not aware that they have to sign a pledge?

A. I am not aware of that; that's right.

Q. Are you aware if they have to adhere to these five tenants in their explanation or acceptance of intelligence design theory?

A. I am unaware of the process for membership among the fellows of the Discovery Institute. So I have no understanding and no opinion.

Q. And with regard to the explanation of ID theory -- use Michael Behe as an example. He appears to be one that you typically debated or encountered in writings -- in his explanations of

Page 118

intelligent design as a theory, does he adhere to those five tenants?
A. Dr. Behe does not adhere to those five tenants. Other members of the intelligent design community by-in-large seem to.
Q. Would it be fair to say then since Dr. Behe doesn't adhere to those that those aren't necessarily required tenants of ID?
A. Well, let me answer that by qualifying my previous answer. Dr. Behe does not adhere to all five. He certainly does adhere to number four, which I think in our list is the insufficiency of the evolutionary mechanism, and he certainly is a creationist from the point of view that he requires that intelligent design, which is the creative act of an intelligent designer was necessary to fashion the bacterial flagellum, the eukaryotic cilium and the blood clotting system.
Q. Could that also be stated another way? For example, the mechanism of evolution, natural selection is insufficient to adequately explain the creation of the bacterial flagellum?
A. I think it is a fair statement to say that one of the central arguments of intelligent design

Page 119

is that evolutionary mechanisms are not sufficient to explain the origin of complex biological structures like the flagellum; yes, I think that is a fair statement.
Q. And that's a statement that you refuted by reference to the scientific literature?
A. That also -- no, not exactly, and I have to qualify this in a certain way. The claim that evolutionary mechanisms could not produce the bacterial flagellum is supported by Dr. Minnich and Dr. Behe and others by the claim that the bacterial flagellum has a property called irreducible complexity, and irreducible complexity means that all of the parts of the flagellum, the cilium, the blood clotting cascade have to be present for the system to have any function that could be favored by natural selection.
So the way in which I answered that argument was by analyzing those systems and showing that, in fact, that claim was not correct and that various parts of those systems do indeed have functions on their own apart from the other components of the system which can be favored by natural selection.

Page 120

So the nature of my refutation of the intelligent design argument was to deal with the one part of intelligent design that truly is testable, and that is the argument that these structures show this property called irreducible complexity. There is a part, of course, of intelligent design -- and it's the main part which is not testable -- and that is an outside intelligence acting outside the laws of nature produce these structures by some sort of a nonnatural creative act. That idea is simply not testable, and it's one of the principal reasons why intelligent design is not science.
Q. In your explanation of your refutation of the concept of irreducible complexity, I believe you defined it so that if a component was removed whether or not that component itself could have an independent function; is that correct?
A. I believe that is correct. I believe that's how I described it.
Q. Now, does not Professor Behe describe it differently, in that -- in that it's not a question if you remove a component that might have an independent function, but then when you remove the component from the system, the system no longer

Page 121

functions?
A. I believe your characterization is not correct, and my characterization is based precisely on Dr. Behe's writings, which I quoted in my expert report, and to read from that on page 13 of my expert report -- and this is a quotation from Dr. Behe himself -- Dr. Behe says, "An irreducibly complex system cannot be produced by numerous, successive, slight modifications of a precursor system because any precursor to an irreducibly complex system that is missing a part is by definition nonfunctional."
Now, that doesn't say the original function has changed. It has said it is by definition nonfunctional, and he further explains why that's important for his argument. "Since natural selection can only choose systems that are already working. If a biological system cannot be produced gradually, it would have to arise as an integrated unit in one fell swoop for natural selection to have anything to act upon."
So the essence of Dr. Behe's argument is that the parts of an irreducibly complex system have no function, and therefore, they cannot be favored

Page 122

by natural selection. So the way I addressed that argument was by taking the very structures that he says are irreducibly complex and showing that parts do have function, and therefore, this argument is not correct.

Q. Have you read Professor Behe's rebuttal report to your report?

A. I have read parts of it.

Q. Does he not address this question of the definition of irreducible complexity in his rebuttal report?

A. Yes, he does address the question, but he addresses it in a way that changes and fundamentally weakens and invalidates his entire argument, and the nature of the way in which he addresses it is by saying that yes, it is possible for parts of the irreducibly complex to have function, but he still considers the system to be irreducibly complex if those parts have a different function.

Now, I suppose that that kind of very careful redefinition can save the idea of irreducible complexity, but it also completely destroys irreducible complexity as an argument against evolution because Dr. Behe seems to admit in

Page 123

his expert report, is that I am indeed right, that you can look at parts of an irreducibly complex system and you can see that individual parts might have selectable functions and that those parts could in principle provide a pathway by which the irreducibly complex structure could evolve, and to me that is giving away the store.

That's saying -- that's admitting that this is really not an argument against evolution, and what he seems to do in the expert report is to retreat to the notion that irreducible complexity is a valid notion unless you can demonstrate a step-by-step Darwinian evolutionary pathway leading to the irreducibly complex structure.

Q. Can you do that?

A. In the case of the flagellum, I cannot. Nicholas Matzke has actually published a paper suggesting how this is done. In the case of other irreducibly complex systems, like the blood clotting cascade, I would argue that descriptions of its Darwinian evolution have been in the literature for quite a long time, mostly out of the laboratory of Russell Doolittle, and I and a number of people have suggested how the eukaryotic cilium could have been

Page 124

produced by a Darwinian step-by-step pathway.

But the essence of my criticism of the argument for irreducible complexity is simply this: And that is that it is entirely true that we do not know enough about all of the structures in the cell to either describe how they all work or to describe how evolution could have produced each of them by step-by-step Darwinian mechanisms. And on the day on which it is possible to describe the step-by-step Darwinian evolution of every single structure in the living cell, it will be time to close every department of evolutionary biology in the world because all questions in that field will have been answered, and I certainly don't expect to see that happen.

What is certainly true is that Dr. Behe's original contention, which is that irreducible complexity proves that the structures he indicated could not have evolved, that contention I would argue is certainly false and has certainly been disproven by careful analysis of the argument.

Q. If irreducible complexity could be proven, would the inference to design be a rational inference?

Page 125

A. Let's analyze your question carefully. If irreducible complexity could be proven, if we take the original definition of irreducible complexity, which an irreducibly complex structure is a part, which as Dr. Behe said, in which the removal of a single part renders the system completely nonfunctional with nothing that can be favored by natural selection, would that present an argument for design or more properly put, an argument against evolution? I think the answer to that is yes, it would.

What Dr. Behe himself now admits is that there are no such structures, and I say that because in his expert report he says yes, there could be systems within one of these structures which perform a different function which could be favored by natural selection. As I understand that kind of admission, that would mean the structure is no longer irreducibly complex.

MR. MUISE: It's almost noon. Let's go off the record for a minute.

(Lunch Recess.)

BY MR. MUISE:

Q. Dr. Miller, before we broke, we were

Page 126

running through some definitions, in particular, the definition of creation science, and I believe you stated that it was important that we carefully define the terms, such as creation science; is that accurate?

A. Yes, I did think it was important.

Q. Now, based on that definition that you provided -- and there was five various tenants that we have gone through previously -- would it be fair to say that intelligent design does not accurately fit that definition of creation science?

A. It would be accurate so long as I remember that when I say creation science, I was referring to young earth creationists. Intelligent design theorists, as I've indicated, are creationists of a different sort. They are progressive creationists. They still -- intelligent design still requires the outside intervention of an intelligent agent, a creative force, to bring molecules, genes and whole organisms into existence. So it still is creationist in that sense.

Q. Now, my understanding is there have been those who have accused you of being a creationist; is that correct?

Page 127

A. That's possible. I can't think of any specific references. Perhaps you can.

(Defendant's Exhibit No. 9 was marked.)

BY MR. MUISE:

Q. I'd ask you to take a look at Exhibit 9, and by the smile on your face, I'm assuming that you've at least seen the passage that's referenced in that exhibit before?

A. Yes, I have. I believe you've handed me an excerpt from an article written by Barry Palevitz, who I believe is at the University of Georgia, who wrote an article in Bioscience that made reference to my book "Finding Darwin's God."

Q. And would it be accurate to say that he, in essence, accuses you or describes you or defines you as being a creationist?

A. No, it's not clear to me. Can you explain exactly where he accuses me of being a creationist?

Q. If you look at the last sentence, he states, "To make matters worse, Miller flirts with the idea of purpose in the hard anthropic principle, another of neocreationism's pet rocks. God created the universe, just as it is, with us (or a species

Page 128

like us) in mind."

A. Do you have a question?

Q. You do not see that statement as putting you in the category of a neocreationist, as he describes it?

A. No, I don't, and remember that somewhat earlier I said that any theist, any person who believes in a supreme being is in some sense a creationist, and I already plead guilty to that particular definition of creationism. What Palevitz does here is basically to say that one of the ideas that I entertained in my book, which is the notion that the universe may have purpose in it, is also an idea that is embraced by what he calls neocreationism. He calls it a pet rock. Saying that two schools of thought embrace a single idea does not mean that those two schools of thought are exactly the same thing.

You might say, for example, that social justice is an idea that is embraced by liberal democracies and social justice is also embraced by people who advocate communism and that doesn't mean that a social democracy and communism are the same thing.

Page 129

In this particular case, you showed me an excerpt from Palevitz's article instead of the entire article, and I think what Palevitz clearly applies to his own writing in the entire article is the notion -- is an idea quite different from what I hold, and that is that I -- and I think most philosophers of science would agree -- I hold the idea that a consideration of meaning and purpose in the universe is an important question that stands outside of science. It's an important question but not one that science can address.

Palevitz takes a much more restricted view, and basically I think holds the view that any question that science cannot address is meaningless, and I completely disagree with Palevitz on that point.

Q. Is that point -- would you consider that to be a philosophical question regarding the nature of science?

A. I would not say it's a philosophical -- well, I wouldn't say it's a philosophical question regarding the nature of science. I think it's a failure on Dr. Palevitz's part to appreciate the limitations of science. Science, as I've indicated

Page 130

before, is a method that tells us or helps us learn about the natural world. It's not a method to answer questions of moral -- it's not a method to answer moral questions, ethical questions or questions of meaning and purpose. These are all important questions, but they're not ones that can be decided by science.

Q. Using that example of two different entities or school of thought to embrace a single idea doesn't necessarily make the two the same, can't that argument still be made between intelligent design and creation science?

A. Oh, I think I made very clear that young earth creationism and the current incarnation of the intelligent design movement are, in fact, different ideas, and we've explored with many of your questions the specific differences between them in great detail, but it's also fair to point out what they hold in common, and what they both hold in common is the requirement for supernatural intervention outside of nature by the creator or by an intelligent designer, and that is a point in common between the two.

Q. And the fact they have a point in common,

Page 131

though, is it not a misrepresentation to call intelligent design creation science?

A. Again, terms and words are extremely important here. As we have defined creation science in this deposition and in your questions and my answers, we have defined creation science as young earth creationism. Intelligent design, as it is advanced by its current advocates, is a variation of creationism, which I have defined as progressive creationism. It's equally super natural, it's equally dependent upon the suspension of laws of nature, and it differs only in detail, and those details being the validity of the geological record, the age of the earth and whether or not these creative events were essentially simultaneous or whether or not they occurred separated by millions of years over geological time.

Q. Did the young earth creationists adhere to or present a principle, irreducible complexity principle that we've discussed briefly?

A. You know, they didn't call it irreducible complexity, but they did present the same principle, and the reason for that is the idea that a multipart system was useless or nonfunctional unless all of

Page 132

its parts were present doesn't originate with the current intelligent design movement, and it didn't originate with Michael Behe. It actually originates to my reading of science with Reverend William Paley in his book "Natural Theology" that he published in 1802.

Now, Paley, of course, didn't know anything about biochemistry, but he did understand that organs in the body such as, for example, the eye, which are composed of multiple parts, would not function in his view if one or more of those parts were missing. Now, he didn't use the term irreducible complexity, but he did ask his readers what good is half an eye? What good would a retina be without a lens? What good would a lens be without a retina? The organ only functions when all of its parts are present.

So, in that respect, that argument -- the argument of completeness of multipart systems as used by intelligent design folks, was used by creation science folks and was used as far back as 1802 by Reverend William Paley.

Q. Well, cannot ideas resurrect or change over time as the scientific evidence might point

Page 133

more clearly towards it as an explanation?

A. Ideas certainly can appear and reappear over time. You said as the scientific evidence points towards it as an explanation. It's not clear to me that the scientific evidence does point towards it as an explanation, but, of course, ideas can have a persistence of their own.

Q. Would you not agree, though, that the ID advocates, for example, Professor Behe, looks at the scientific evidence and he reaches the conclusion that the evidence shows this concept of irreducible complexity?

A. There is no question that Dr. Behe has made an argument that is based on observations from a scientific method to support the conclusion of irreducible complexity. As I've explained earlier, I think that conclusion is an error. I think it's a misinterpretation of that data, and my analysis of that is actually shared by the rest of the scientific community or by most of the scientific community.

Q. Not all of the scientific community.

A. Since Dr. Behe himself is a member of the scientific community, I think it's fair to say that

Page 134

he doesn't share my analysis of his ideas.
Q. I'm glad that you acknowledge that he's a member of your scientific community.
A. I've never claimed otherwise.
Q. And I may have misapprehended something you said previously, but did not Darwin himself -- I think you referenced the question of irreducible complexity -- he offered that as a counterhypothesis to his theory?
A. Are you asking if Charles Darwin offered irreducible complexity as a counter argument to his theory?
Q. There was a component of his agreement dealing with irreducible complexity. I believe you may have quoted in -- I can find it probably in a moment -- "Finding Darwin's God" that if irreducible complexity was, in fact, found, then Darwin's theory is doomed, I believe are the words you used in your book.
A. Charles Darwin did not use the term irreducible complexity. In "The Origin of Species" he did write that -- this is a paraphrase, but it's close to what he said, and we can look up the exact words if you care to -- is if I could find any

Page 135

structure or organ which could not have been formed by numerous, successive, slight modifications of a precursor structure, then my theory would absolutely break down.
Now, Darwin said that or words to that effect in the origin. The sentence that follows that, however, is also important. In the sentence that follows that, Darwin wrote "But I can find no such case," and I would argue that that is still true today. There is no such case.
Q. How do you test that, numerous, successive, slight modifications? Is that testable?
A. Yes, I think it is testable, and I think it's testable in a number of ways. Darwin in that made a very clear prediction, and that clear prediction is that when we look at complex systems or structures, we should be able to see a series of steps. When we complete -- when we completely analyze the system, we should be able to see a series of steps by which that organ or compound or biochemical machine could have been produced from a precursor structure by a series of modifications, each of which should have been favored by natural selection at every step of the way, and that is

Page 136

still the test that is applied to complex systems by scientists today.
Q. I handed you that one excerpt from that article regarding you as a creationist or at least the article by Palevitz.
A. It's Barry Palevitz, right.
Q. Do you know who Niall Shanks? N-e-i-a-l-l (sic), I believe, is how you pronounce the first name.
A. The only thing I know about Niall Shanks is that I believe he wrote a book called "Darwin's God."
Q. I believe the book was "God, the Devil, and Darwin."
A. Well, then maybe I don't know who he is.
Q. Has anyone ever told you or do you know if he described you as a cosmological creationist?
A. I'm unaware of that.
Q. Do you know who Frederick Crews is?
A. Yes.
Q. And he's at the University of California?
A. That's my understanding.
Q. Do you know what he teaches there?
A. Not exactly but I suspect he is in

Page 137

psychology. Does that sound right?
Q. Could very well be.
A. I'm not positive, but I believe he's either in the English department or the Psychology department.
Q. Are you aware that he described you as a God of the gaps creationist?
A. Not in so many words. I am aware that he wrote two reviews of books about intelligent design and evolution and religion that appeared in successive issues in the New York Review of Books, and in the first review, he reviewed a number of books about intelligent design, including books by Behe and Dembski and -- at least by those folks and maybe a few other people. Then he also reviewed two books that countered intelligent design, and those were Robert Penick's book, the "Tower of Babel" and my book, "Finding Darwin's God." And then in the second review, he reviewed a number of books that dealt with evolution and religion, among them Stephen Jay Gould's book, "Rocks of Ages," and a book by Michael Ruse called "Can a Darwinian be a Christian?" And he then reviewed my book again in the second review. So my book had the -- I'm not

Page 138

sure if it's an honor or not, but it had the distinction of being reviewed twice in the New York Review of Books by Professor Crews.

Q. And in any of those reviews, do you recall if he described you as a creationist or God of the gaps creationist or words to that effect?

A. I haven't memorized the reviews, and I don't recall. I do recall that the first review liked my book very much and described its first half as being brilliant. When a reviewer -- I hope you will forgive my selective memory. When a reviewer in a prominent publication applies the word brilliant to one's own work, one tends not to forget it. But I also remember that Crews said something to the effect of in his book's brilliant first half, Miller did the following. And when you see that, you realized that next week he's going to have a different opinion about the second half.

Really in the last third of my book I tried to make the case for the compatibility of evolution and religion, and Crews' position -- and I don't remember the specific words. So he may well have used the words that you described, but I don't remember.

Page 139

In the second review, Crews analyzed my book, Gould's book, Ruse's book and perhaps a couple of others. He might have analyzed one of John Haught's books, and all of those books that he reviewed took the position that evolution and religion, western religion are reconciliable, are compatible. Crews clearly does not believe that, and he was uncompromising in his criticism of any book that took the view that evolution and religion or even a book that took the position that science and religion are compatible. I think Crews is profoundly mistaken on that point, but I know it's a view that he holds.

Q. Well, how do you see then science and religion being compatible?

A. Well, there is a short answer, and there is a long answer, and the short answer is that I'm a Roman Catholic. The acceptance of scientific rationality is very much in the Catholic tradition, and I routinely point my scientific friends to I believe it was an encyclical written by the late Pope John Paul, II called the "Fides et Ratio," which in English would mean faith and reason. And in the encyclical John Paul, II argued that faith

Page 140

and reason are both gifts from God. Religion is the product of faith and science is the product of reason. And therefore, if we understand -- if we apply faith and reason correctly as objective and reliable tools to the nature of the world around us, ultimately the conclusions of both should be compatible.

So that's the short answer, which is I adhere to a church that has a long tradition of teaching that science and religion are compatible.

With respect to the long answer, evolution is a scientific analysis of the origins of our species, and what evolution tells us with quite an overwhelming amount of evidence is that our species has a history on this planet, that we find our history in the process of evolution that produced everything else on this planet, and that unites us with the fabric of life on the surface of the earth.

When I read Genesis, which I take to be a spiritually correct account of the origins of our species and others, I find repeatedly verses that say that God commanded the waters of the earth and the soil of the earth to bring forth life, and from an evolutionary point of view, that's exactly what

Page 141

happened.

So that's how I see the compatibility of the two. I did write a whole book on the compatibility of evolution and religion, and I think you'd probably like my answer to be somewhat shorter than that. So that's as far as I'll go right now.

Q. And that book being "Finding Darwin's God?"

A. That is correct, sir.

Q. Now, as you said, you pled guilty to being accused as being a creationist. Is a creationist somebody who adheres to creationism or is that again, you know, we've got to be careful about our terms?

A. Yes, let's be very careful about our terms because when, as you said, I plead guilty to being a creationist, what I actually plead guilty to was being a theist, being a person who believes in God; and therefore, yes, I believe at some point there was a creation event in which God brought the universe into existence.

Now, in the common usage of the term creationist in Dover, in this lawsuit and in the discussion that we're having about intelligent

Page 142

design, the word creation is actually taken to mean something else, something other than that minimal belief that a God exists but whether a belief that evolution is not an adequate explanation for the origin and diversity of species and that, in fact, species were directly created and shaped by a super natural force. In that respect, no, I am not a creationist.

Q. So how does God then operate with regard to evolution in your view of the science?

A. You are asking me, of course, for a theological issue, which is how does God operate, and I'm tempted to retreat behind Einstein's statement that "subtle is the Lord."

We look at events, whether they are events in our personal lives or historical events or political events and events in natural history. We identify God's actions and God's motivation in those events only at great peril, and by that I mean great theological peril. So you will not, I think, get from me or from anyone else a completely satisfactory answer that will exhaustively explain how the Lord God works his will.

The general answer, I think, is actually

Page 143

pretty simple, and that is if God exists, he is the author of everything in the universe. If God exists, he created the universe, he coined the laws of physics and chemistry, he created the material upon which life is based. It is certainly not too much to think that a supreme being capable of that kind of overall architecture of the universe could not have organized the universe in a way that the events, the playing out of the laws of his own making could not have accomplished his purpose. And when we look at evolution and when we see this incredible process that brings so much diversity and so much adaptability to life on this planet, it's entirely reasonable to say that if part of your divine plan is to have a universe where life is possible, then evolution itself could be a playing out of the plan of God.

Q. And that view distinguished from ID advocates would be what?

A. The big distinction between that and intelligent design advocates -- and I don't mean to be flippant in my answer -- but it's to say that intelligent design advocates think much less of God than I do, which is to say the whole idea of

Page 144

intelligent design is that God was clever enough to create a universe where the basic laws of chemistry and physics could sustain life but not clever enough to create a universe where the basic laws of chemistry and physics could evolve life.

So that in their view if they identify the designer as God, in their view the designer not only set up the laws of the universe but had to intervene repeatedly and persistently violating his own laws to design organisms, to design biochemical machines and to design organ systems in order to meet his purposes, and that's the essential departure between my view and the view of intelligent design advocates, which is that I find natural processes quite sufficient to account for living organisms. They find natural processes even though they say the processes themselves were the product of a designer, they find those natural processes insufficient. So they have to postulate constant creative creationist design events in order to bring these things into existence.

Q. Now, in that answer you said if they identified the designer as God?

A. Yes.

Page 145

Q. Is it not accurate to say that an ID advocate does not necessarily have to identify the designer as God?

A. Well, when you say does not have to, there is no, as far as I know, membership criteria to call one's self an ID advocate. Most members of the intelligent design community are quite open about saying, yes, when they say the designer, the force that they have in mind is, in fact, the God of Abraham. William Dembski has said that quite openly, Phillip Johnson has said that and occasionally Michael Behe has said that, as well.

The other point that's worth noting is that where intelligent design advocates are careful not to use the word God and instead to say that the designer could be anybody, the other ideas that they put forward for the possible identity of a designer are really not credible even by their own standards, and the ideas that I have heard are space aliens, time-traveling cell biologists or beings from another dimension, and it's not clear to me that intelligent design advocates actually seriously hold the view that the designer could have been any of those folks.

Page 154

I claim no personal credit for any of the work that provided the data. I simply say that I have pointed out a contradiction between their claims and their prediction of the experimental work, and it's on the basis of such contradiction by experimental fact that scientific hypotheses are found wanton and generally abandoned, and in my view that's exactly what should happen to the idea of irreducible complexity.

Q. You would agree, though, that it's a scientific hypothesis?

A. Help me out with what it is.

Q. The concept of irreducible complexity.

A. Okay. As I understand the concept of irreducible complexity, it is a claim, and it is a claim that certain specific structures or biochemical pathways, flagellum, cilium, blood clotting cascade are composed of systems of well-matched interlocking parts wherein the removal of one part causes the system to stop functioning. That is a claim that's made on the basis of scientific evidence.

What I have said and what I have written is when that claim is carefully examined, also on

Page 155

the basis of scientific evidence, it turns out to be incorrect.

Q. The claim itself, though, is a scientific claim, would you not agree?

A. If the claim is that the bacterial flagellum is an irreducibly complex structure and irreducible complexity is defined as so and so, then I would agree that claim is a scientific claim, but it's very important to appreciate the fact that the claim that a structure is irreducibly complex is not the claim that it was intelligently designed. That's different. The argument that the bacterial flagellum was intelligently designed is an argument that follows only on the basis of I guess a couple of points being true. One is that the flagellum is indeed irreducibly complex; two is the inference that that means that evolution could not have produced it; and three is there are no other mechanisms that could have produced it. Now, all of those are entirely negative questions. None of them produces any positive evidence for design.

Q. If you can prove that flagellum is irreducibly complex --

A. Which, of course, it is not.

Page 156

Q. And I'm asking you a hypothetical in this context. Flagellum is irreducibly complex, that the mechanisms of evolution, natural selection could not produce it, and I think the third you said there was no other mechanism that could account for the flagella. Are those the three you just described?

A. I believe those are the three that I mentioned.

Q. Would it be reasonable to infer that it was designed, if you could prove those three elements?

A. The answer -- I'm just scribbling here because --

Q. Yes, but that's an exhibit, though. Let me give you a piece of scrap paper.

A. Oh, I'm sorry.

MR. MUISE: No corporal punishment. Just so I can make it clear on the record, he just handwrote inadvertently on Exhibit 9 prove IC and then EVOL not produced, period, in handwriting, which is not part of the exhibit.

THE WITNESS: My apologies. I think like many questions your questions has a

Page 157

built-in assertion that's important to separate from the question itself, and the built-in assertion is that it's possible even in principle to prove things. Science doesn't prove things. It's impossible, for example, for me to prove that the properties of water are entirely due to the combinations of hydrogen and oxygen and the water molecule. I can rule out several other alternate explanations for the properties of water, and that's the one that seems most likely. But in science we don't prove things. Really we disprove things. And in this particular case, you asked me if I could prove that the flagellum was irreducibly complex? Again, we don't prove things in science. So I'm not going to accept a hypothetical that it could be proven that it was irreducibly complex. I would maintain that science has already -- as I say, science disproves things, and I think science has disproven the notion that it's irreducibly complex.

Page 158

The second thing you asked was whether or not evol -- if I could prove that evolution could not produce it. The only way that you could possibly do that is basically by saying that you have knowledge of every single evolutionary pathway that could lead to this particular result, and you can on the basis of scientific evidence rule out each and every one of them and that you have imagined all possible pathways and that no one else in the world will ever or can ever imagine another pathway. That's another reason why science doesn't prove things. What I -- and I forget the third portion of the question.

BY MR. MUISE:

Q. You said no other mechanism.

A. Oh, then you would also have to rule out any other mechanism other than evolution to do this, and I think your hypothetical question was if you could do all of these things, which I then suggested you really can't, would this amount to evidence for decision? The answer actually is still no.

In terms of evidence for design, we're

Page 159

looking for some direct physical evidence of some sort or another that would be admittable by the usual standards of science that would, in effect, give us a pathway to the designer, a fingerprint, a footprint. You know, if someone broke into this room when we were all out for lunch and things were moved around, we might look for a drop of blood if they broke through the windows to enter, we might look for a fingerprint. We might look for some evidence of outside intervention.

I -- in the three cases that you just suggested to me, I don't see anything that would give me evidence of outside intervention. Instead what you argued is if we could show that this process or that process or the other process could not have produced it, is that evidence for outside intervention? The answer is no, it's not direct evidence, not unless you can establish a way to say that you've ruled out every single possible natural possibility.

Q. Now, regarding Dembski's claim, complex-specified information?

A. That's right.

Q. Is that claim a claim that can be tested

Page 160

based on scientific evidence?

A. It's an interesting question. Dembski, as I understand his arguments, has claimed that living organisms contain what he calls complex-specified information and that natural processes cannot produce complex-specified information and that only an outside intelligence, therefore, could produce complex-specified information. Not being a mathematician and not claiming to be one, there are certain elements of Dembski's arguments that when I try to apply them to biology simply fail, and one of these, for example, was something that I brought up in the debate at the American Museum of Natural History and being an experimental scientist rather than an information scientist, a theoretical scientist, I pointed out to Dr. Dempsey a paper that had been published in proceedings of the National Academy of Sciences -- I don't have the reference with me, but I know I could get it easily -- in 2002 in which bacteria were placed in a laboratory experiment and subjected to various kinds of stress. Over about 2000 generations a number of bacteria evolved adaptations to the stress, which enabled them to survive much more successfully and to

Page 161

reproduce much more quickly than their fellow bacteria, and they quickly came to dominate the culture.

One of those adaptations was the duplication of a certain genetic region of the bacterial chromosome. In other words, they increased the amount of genetic information in their own DNA, and I asked Dr. Dembski if that didn't amount to a direct contradiction of his ideas about complex-specified information. Here is a natural system with no outside intervention under controlled laboratory experimentation in which the amount of genetic information had been increased by natural evolutionary processes and that increase in information had had a positive value in natural selection, and to my reading he had no satisfactory answer to that particular criticism.

I think biologists in general have not been impressed by Dembski's arguments of complex-specified information on the basis of exactly the kind of practical experimental result that I just mentioned.

Q. These experiments that you're referring to, they weren't the Lenski -- any of the Lenski's

experiments?
A. Lenski's experiments, I think, bear to the same point, but the specific experiment that I brought up, I believe, was not done in Lenski's lab. In particular, you might be referring to a computer simulation program that Lenski and Penick have published about in Nature of 2003; and no, that's computer simulation experiments. I spoke of -- we're dealing with real bacteria, living organisms.
Q. With regard to those computer simulations of Lenski experiments, are you familiar with those experiments?
A. Not in an expert sense, but I have read the paper, and I am familiar with the experiments.
Q. My understanding is Lenski has for a significant period of time tried to create laboratory experiments, I think, growing bacteria and getting the same results that he got through the simulated virtual experiments but hasn't been able to show it in the experiments but has only been able to show it through the computer of the virtual models.
A. I heard a statement, but I haven't heard a question yet.

Q. Okay. Is that true, though?
A. That's not my understanding. Lenski has done a number of long-term multigenerational experiments with bacteria, and in these experiments the ones that I know of he's found significant genetic changes, increases in the size of the organism, dramatic increases in genetic information, duplications of genes and a whole range of genetic changes that have had adaptational value very much in line with what you might call the Darwinian idea of natural selection and evolution.
My own reading of the computer experiments, which he published in associating with Robert Penick and a couple of other authors is that in this he tried to design a self-replicating computer program that would have some of the characteristics of living organism, and he was able to know that when you try to set up a self-replicated computer program, even a very simple one, it very quickly and quite spontaneously increases in its complexity, and that increase in complexity has adaptive value.
I saw those experiments as complimentary rather than going beyond. I saw them as

complimentary to the experiments that Lenski has done with live bacteria in laboratory situations.
Q. Does the evolution process -- and this may be too general, but I'll ask it anyway. Does it lend itself to the evolution from simple to the complex? Meaning is that how we should see in science, if we're understanding how the mechanism of evolution operates, that we should see at the earliest stages life forms that are simple and as time continues and as organisms evolve, then we see complexity as opposed to the other way around or does it make a difference?
A. It does make a difference, and I'm not going to agree to either of your hypotheticals here. There is a very old and largely discredited view of evolution not really attributed to Darwin but that cropped up towards the end of the 19th century that said that evolution would tend toward complexity and ultimately would tend towards perfection.
I think for the last hundred years or so we've had a much more realistic and much more sophisticated view of evolution, and that is that evolution has no inherent trend either towards complexity or towards simplicity. And what

evolution does is over time to explore adaptive space. Now, the term adaptive space was coined by a scientist named Wright, and the idea is basically simply stated that there are when you get right down to it many ways to make a living.
Simplicity, which is to say being a singled-celled bacterial organism with a very small genome and a limited number of metabolic processes, simplicity is a terrifically successful lifestyle. In terms of biomass, about 90 percent of all of the living things on this planet are single-cell bacteria. So obviously they've done extremely well and they've been favored by evolution.
Another area of adaptive space is the photosynthetic organism, the plant, and as you look around, you'll see the plants dominate the landscape around us.
Complexity is only one direction in which living things can evolve, and I think it's fair to say that living things evolved -- have evolved towards complexity and towards simplicity repeatedly in the history of life. Life is more like an explosion that goes off in every direction than something that moves inexorably from the simple to

Page 166

the complex.
Q. I want to go -- we've been going down different pathways. I want to go back to our definitions that we were talking before about creationism and creation science, and again, I'm understanding your distinction of a creationist when you said I plead guilty to being a creationist, but if you could explain how your view which has you tagged as a creationist towards the influences of God and the natural world is different from the view that you claim makes ID creationists?
A. Okay. Now, please remember you said the view that had me tagged as a creationist. Now, you presented me with a quote but it didn't tag me as a creationist. It simply said that I felt one viewpoint that was one of neocreationism's pet rocks. Now, that's to me not the same as calling me a creationist. So I'm not aware that I've been tagged as a creationist.
Q. Or God of the gaps creationist. Assuming -- and I know --
A. That's a quote that you didn't present to me and I don't have in front of me. So I'm not sure if that's the exact wording or not.

Page 167

MR. WALCZAK: Well, I guess regardless of what other people call him, I mean what's the relevance of that? I mean he is what he is, he can explain it, and because somebody else labels anybody as something, I mean how is that relevant to anything we're talking about?
MR. MUISE: That's right; I think labeling ID as creationist is a misrepresentation, and so it is appropriate to see how labeling all works its way out in the course of this litigation. I'm trying to get to the substance of the label. That's why I think the label creationist people paint that with a broad brush to get a particular result they want, and I think you've been -- well, you stated you were a creationist, and I found it particularly in that one article, and I've been giving you other references -- unfortunately, I don't have the quotes from them -- but I've been told that you've been labeled as a creationist, and you said I'm a creationist, but you obviously qualified

Page 168

that.
BY MR. MUISE:
Q. I'm just trying to get at the distinction between you as a creationist and use the definition that you used that you identify yourself as a creationist, how is that, you as a creationist, different from ID advocates as creationists?
MR. WALCZAK: I'm just going to note an objection that you've asked this. I think he answered it very clearly, and I'm happy to have him answer that again. But if we start running out of time, then I'm going to say all right, you know, we wasted some time here, but go ahead and answer that.
THE WITNESS: I appreciate having Vic here to help me, but I was about to say I think you have asked that question and I think answered it, and I'll answer it again. And that is that any person who calls themselves a theist who is a believer in God, in a supreme being, is by a certain sense of the definition a creationist because they believe in creation. So, yes, I accept that certainly.

Page 169

The difference between, as you wanted to hear, between me and intelligent design creationists is actually very simple and very straightforward. And that is even if I think the ultimate origin of existence itself is in God, I believe that that creator created an orderly universe that we can investigate through the methods of science, and in those investigations through the methods of science, it's clear to me and it certainly is the scientific census that we have discovered the outlines and many of the details of the processes that produced living species on this planet, and that process is known as evolution.
The intelligent design creationists or progressive creationists as I call them say no, that process is not adequate. We have to explain the origin of complex structures, the origin of the animals in the Cambrian explosion, the origin of human beings, the origin of the bacterial flagellum, of the clotting process, of the

Page 170

vesicle targeting system and cells.
We have to explain all of these things by proposing the direct supernatural intervention of a intelligent designer acting outside of nature by means and mechanisms which are undetectable by the methods of science producing each of the structures or organs or organisms by unique and distinctive creative acts.
In short they have to postulate the existence of a designer who has to violate his own morals in order to achieve his ends. That's the difference.
BY MR. MUISE:
Q. Now, I had asked you before the last break whether you consider ID to be science, and you stated that it's not. What do you consider intelligent design to be?
A. I think intelligent design is fundamentally a theological and a philosophical idea that seeks to invalidate evolution for religious reasons because it fears what it regards as the antitheological character or antitheistic character of evolution.

Page 171

Q. Now, you would agree, would you not, that Darwin's theory of evolution has metaphysical implications?
A. I would agree only in the sense that everything in science has metaphysical implications in the sense that I think it has metaphysical implications when you realize that we are made up of the same matter as the nonliving world. I think it has metaphysical implications if you realize that life on earth has changed over time, which is what the geological record tells us, and I think it has metaphysical implications when you look through the Hubble space telescope and you see hundreds of millions of galaxies each of which has hundreds of millions of stars scattered across the universe.
All of these things have metaphysical implications because they're all profound elements of science, and yes, Darwin's theory of evolution fits right into that fabric. Because it tells us something about the nature of the world, it has implications.
Q. So it would be accurate to say you can't just disqualify a theory merely because it might have metaphysical implications?

Page 172

A. I think it's true that all science -- now, perhaps I'm not understanding what you mean by the word metaphysical, and perhaps it would be useful to me for you to define that. But remember that I agreed -- I said yes to your question only in the sense that I regard all of science as having what you called metaphysical implications, and evolution is certainly part of science, but perhaps you should design what you mean by metaphysical in the context of your question.
Q. Well, in the context of evolution, obviously -- and I think we've covered some of this previously -- the implications on God, the existence of God, of the supernatural, those implications arise from Darwin's theory and, in fact, is probably what fuels much of the controversy over the theory. Would you agree with that or is that too broad of a statement?
A. I have to say that was not what I understood by the word metaphysical. I would have called those -- when you're talking about God and the supernatural, I would have called those theological implications, and I would have given you a slightly different answer. It is certainly true

Page 173

that in the view of many people, there are theological implications to Darwin's ideas.
I certainly think that evolution as an idea, like all of science, is theologically neutral, and what I mean by that is that evolution is a non -- properly understood evolution is a nontheistic idea, meaning it doesn't make reference to a creator, it doesn't prove the existence of a creator, it doesn't disprove the existence of a creator, and that's true of all of science.
Q. I'm sure you're aware of Richard Dawkins' -- I don't know if it's famous -- infamous statement, "Darwin made it possible to become an intellectually fulfilled atheist"?
A. I'm aware of that statement.
Q. Do you agree with that statement?
A. Probably not because I think one -- it depends on what one means by intellectually fulfilled, and I think perhaps Dawkins meant that before Darwin, it was not possible for an atheist to have a convincing explanation of the diversity of life. After Darwin, it was possible for an atheist to have a good explanation for the diversity of life. In that respect, yes, I suppose that

Page 174

1 statement was correct.
2 So in that narrow sense, I certainly would
3 agree with what Dawkins said in that particular
4 respect. As a theist, as a person of faith, I'm not
5 sure atheism is a complete answer to what we see in
6 the world around us, and therefore, even though
7 Richard Dawkins who is an acquaintance of mine
8 regards himself as an intellectually fulfilled
9 atheist, I'm not sure he really is.
10 Q. Let me add another quote to that, and then
11 I'm going to follow up with another question.
12 Stephen J. Gould, a paleontologist at Harvard -- I'm
13 sure you're familiar with him. I believe he's
14 passed on; is that --
15 A. I'm afraid so, and Steve was a personal
16 friend of mine. So I know him very well -- knew him
17 very well.
18 Q. I have here as a quote -- and obviously I
19 did quote this directly -- "Before Darwin we thought
20 that a benevolent God had created us." Are you
21 familiar with that --
22 A. No, I'm not. Do you know where that quote
23 comes from?
24 Q. I don't know if it was quoted from out of

Page 175

1 the "Blind Watchmaker." I may have that incorrect.
2 Are you aware that he's made any statement similar
3 to that?
4 A. I'm perfectly willing to believe that
5 Gould might have said that. I don't know the
6 context, of course.
7 Q. George Gaylord Simpson, is that a person
8 that you recognize?
9 A. The late George Gaylord Simpson was a
10 great evolutionary biologist and paleontologist.
11 Q. And I have a quote from him from the
12 "Meaning of Evolution: Man is the result of a
13 purposeless and materialistic process that did not
14 have him in mind. He was not planned." Do you
15 recall if he made a statement similar to that?
16 A. Again, I don't know it specifically; but
17 yes, that is certainly something that GG Simpson
18 could have said.
19 Q. Well, given those three individuals that I
20 identified to you, does that not counter your claim
21 that evolution is basically neutral?
22 A. No, it doesn't counter that claim at all,
23 and the reason for that is when you analyze every
24 single one of those statements, you can ask a very

Page 176

1 straightforward question. When George Gaylord
2 Simpson, for example, says man is the outside of a
3 process that had no purpose, that did not have him
4 in mind, is that a scientific statement? Is that a
5 statement that is testable by the mechanisms and
6 tools and experimental procedures of science? The
7 answer is of course not. Considerations of meaning
8 and value and purpose lay outside of science.
9 So what George Gaylord Simpson was doing
10 when he wrote those words was making a personal
11 statement on the meaning or lack of meaning that he
12 sees in life based on his informed understanding of
13 evolution. That's not a scientific statement.
14 That's not an inherent part of solution as a
15 scientific principle or evolutionary theory. That's
16 simply what George Gaylord Simpson thinks evolution
17 means.
18 If, for example, you were to quote John
19 Hort from Georgetown University, who I believe will
20 be an expert witness at the trial, you would come
21 across statements that basically would say that
22 evolution shows us that the universe is brimming
23 with beautiful possibilities for potential life but
24 it's brimming with fruitful outcomes for the process

Page 177

1 of evolution and evolution of new living organisms.
2 Hort would then say that in his view, the
3 purpose of evolution is to produce a universe that
4 is fruitful in terms of the life it brings forward
5 and is pleasing in the sight of God. Is that a
6 scientific statement? No, of course not. And the
7 point that I'm trying to make is that it is possible
8 for different people with different theological and
9 philosophical persuasions to look at evolution,
10 which really is a religiously neutral document --
11 excuse me, a religiously neutral doctrine, and apply
12 their own philosophical or theological
13 interpretations to it.
14 In the case of John Hort, who is a
15 Christian and a believer, he sees this as a proof of
16 God's providence, as he calls it, his providing for
17 the world. In the case of Richard Dawkins, he looks
18 at the universe and he sees a universe that is bleak
19 and demanding and uncompromising in its brutality.
20 And what I would suggest to you is those statements
21 say a lot more about the personality of the person
22 making the statement than they say about the science
23 of evolution.
24 Q. I'm assuming you would hold those same

Page 178

standards to those who advance intelligent design, for example, the fact that they may have philosophical and theological views it shouldn't disqualify them as scientists?

A. Having a philosophical or theological view -- and I've got those, too -- doesn't disqualify anyone as scientists. The only disqualification is if you try to pass off what are philosophical and theological views as science itself, and in my view, that is often the problem with intelligent design.

MR. MUISE: Mark this.

(Defendant's Exhibit No. 10 was marked.)

BY MR. MUISE:

Q. I'm handing you what's been marked as Exhibit 10, which I believe is a chapter from your 1995 edition of Biology?

A. Well, it's two pages, not the chapter.

Q. I'm sorry, two pages.

A. And one of the pages is 652, and the other page is not numbered. It's the beginning of section 30-2. So these are two pages from chapter 30 of our textbook entitled, "Comparing Invertebrates."

Q. On the second page of that under the 30-2 subheading, it has in bold "Evolution is random and

Page 179

undirected." Do you see that?

A. Yes, I do.

Q. Is that a scientific statement or philosophical statement?

A. I took an oath to tell the truth, the whole truth and nothing but the truth, and I will tell you the truth, which is I think that's a philosophical statement, and I don't think it belongs in the book.

Q. Have you subsequently removed that statement from your book?

A. Is this copied from the 2004 edition?

Q. My understanding is it's been copied from the 1995 edition?

A. Oh, excuse me, I didn't quite understand when you introduced this exhibit which book this was from. So the dragonfly book, which is the book that is under consideration in Dover, is an entirely different book from this one. This book is generally known as the elephant book, and the animal on the cover is not a trivial matter. This is a book that was written in the early 1990s. This is -- as I said, this is a statement with which I do not agree, and when you say have I removed the

Page 180

statement from the book, the dragonfly book is written on metaphorically speaking a blank sheet of paper. So it's not as though we took this old book and edited it to produce the new one. We wrote it from scratch.

I would be very much surprised if you could produce any statements from our current book, either the 2002, 2004 or the 2006 copyrights that say anything like this. Can you?

Q. Well, the way this works is I get to ask the questions and not you, but I appreciate what your concerns are. Let me ask you about with regard to that statement that's in the 1995 edition --

A. Now, again, let me qualify that. It is the previous book. It's a different book. It's not just a different edition. Okay.

Q. Did that comment receive any criticism that you're aware of?

A. Yes, it received criticism from me as soon as it was published.

Q. So you didn't have a part in putting that sentence in there?

A. This particular chapter was written by my coauthor, Joe Levine. Joe and I write the book

Page 181

together. We edit each other's chapters, and I have to say that in the pressure of getting the book ready for press I don't always read what my coauthor has written as carefully and as thoroughly as I should. But as soon as a number of people pointed out the existence of these statements, I told my coauthor under no uncertain terms I was not happy with philosophical statements of this sort being in our textbook, and I know that no such statements appears in any of the books that we've published for the past four or five years, and I can't remember exactly when we managed -- which printing we managed to get this removed from this book, but I know it's no longer in the latest version of this particular book. And again, this is a different book from the one that is being used in Dover.

Q. Did your coauthor ever give you a reason as to why he put that in there?

A. Yes, he did, and he said that he put that in there because he had been strongly influenced by a number of very, very well-written essays by Stephen Jay Gould arguing that evolution does not have an inherent direction towards complexity or purpose or towards producing human beings with a

Page 182

goal in mind. And I told him I thought that was a fair reading of Stephen Jay Gould's statements. But when you say that evolution is undirected, whether or not the natural process is directed or not, whether or not it has a purpose or not is really a consideration or it's a question I should say that science simply cannot answer. So to assert that it is undirected is every bit as nonscientific as it might be if I were to assert that it is direct because any such direction would exist outside of nature.

Q. Now, we've been talking about ID as science, and my question to you is do you believe you're qualified to assess whether something is or is not science? Obviously, since you've offered that opinion, do you believe you have the qualifications to make that determination?

A. I think any person who is trained as a scientist should have an understanding of what qualifies as science and how the scientific method works. So in that respect, yes, I think I certainly am qualified to have an opinion on that matter.

Q. And that's based on the fact that you're a

Page 183

scientist?

A. That's based on scientific training, that's based on 31 years as a working experimental scientist. That's based as being an officer in the major scientific society of the United States, and it's based on three decades of scientific teaching and writing.

Q. Would you qualify intelligent design at all as a pseudoscience?

A. I'm not quite sure what the word pseudoscience means. I hear it used all the time. It's not a term that I'm unfamiliar with, but I don't understand what it means. And my characterization of intelligent design would simply be a theological idea that in my view pretends to be science and, in fact, is not.

Q. Now, is it not the true that idea – and I know you've qualified some of your prior answers with your limited knowledge of the history of science – not necessarily limited knowledge but not expertise per se, but isn't it true that some ideas have started out as not considered scientific but over time have been considered scientific, and I use the example of alchemy becoming chemistry? Is that

Page 184

not a part of the history of science?

A. I was going to ask you for an example of an idea that started out being not regarded as science and came to be regarded as science, and unfortunately for the question you provided me with what I think is a very bad example. Alchemy certainly did not become chemistry. Alchemy was the attempt to turn base metals into gold. When you say that becomes science, well then perhaps there are people out there who are now chemists who are turning base metals into gold, and if there are -- if there are any of those people, I'd like their phone numbers and I'd like to be able to work with them.

I think it's fair for say that alchemy was not science and it never became science, but rather many of the techniques that alchemists tried to use were subsequently picked up by people who managed to use them to found and to build the science of chemistry. So I think it is certainly not true that alchemy ever became science, and I was hoping you would give me another example of an idea that was first regarded as pseudoscience that became science because I can't frankly – I frankly can't think of

Page 185

any.

Q. When you refer to the techniques of alchemy, is it possible that some of the concepts of intelligent design which over time may eventually be accepted by the scientific community, for example, the complex-specified information?

A. I don't think so and for a very direct reason, and that is it is absolutely correct that living systems contain a great deal of information of the specifics of the DNA sequence, our genomes, for example, have information content. There's absolutely no question about that. But the central contention that, as I understand it, is raised in Bill Dembski's arguments is that an intelligent agent is necessary for the generation of the complex-specified information that is found in living systems.

I find it very unlikely that that idea will ever become part of mainstream science because of the fact the demonstrations of the production of biological information by the laboratory experiments, for example, that I mentioned before are so common. In other words, it seems very obvious to molecular biologists and geneticists that

Page 186

genetic information can arise by gene duplication and by natural selection in a way that clearly violates the central ideas of Dembski's thesis; and therefore, it's very hard for me to see how that will ever become a part -- an accepted part of mainstream science.

Q. Who was -- and the name just escaped me -- the one attributed to the funding of the DNA?

A. Oh, you mean James Watson and Francis Crick?

Q. Correct.

A. Now, Watson and Crick did not discover DNA. DNA was actually discovered in Germany in 1880 by Friedrich Miescher, but Watson and Crick used the x-ray traction patterns of Roslyn Franklin to develop what we call the double helix model of DNA structure. I'm sorry. I can't help you, sir. Being a biology professor, I can't help that sort of thing. My apologies.

Q. You don't have to apologize. I'm doing it myself. Did not Crick, though, have a theory because of the complexity of DNA that it had to have come from outside the confines of this earth?

A. I don't think that's a fair statement.

Page 187

Francis Crick over the years has suggested that life on our planet may be the result of a process called panspermia, p-a-n-s-p-e-r-m-i-a, in which life was scattered here either intentionally or unintentionally by other planets. So, yes, Crick certainly had that idea, and several other people have had that idea, as well.

Q. Couldn't that not be a designer of the intelligent design theory?

A. As intelligent design is currently formulated, no; and the reason for that is the directed panspermia that Crick would have imagined would have involved very simple organisms, such as bacteria or bacterial viruses, and many of the events, the organs, the structures and the biochemical machines that intelligent design says must have required the actions of the intelligent designer exist in far more complicated organisms and in multicellular organisms, as well. For example, intelligent design advocates like to point to the animals that appeared during the Cambrian as evidence of intelligent design.

When Francis Crick was talking about panspermia, he did not imagine Cambrian era animals

Page 188

that are hitchhiking on a meteorite. He imagined bacteria; and therefore, even if Crick were right or if the panspermia had been directed -- meaning directed to our planet from another source by some sort of intelligent, according to the basic arguments raised by the intelligent design people, intelligent intervention would still be required to bring about the world that we see today.

Q. Is this idea of panspermia advanced by Crick, is that a scientific theory?

A. It is certainly a scientific hypothesis in the sense that it's a scientific statement. To some degree, one could argue that it might be testable by the method of science if, for example, in the future we are able to travel widely and freely throughout our own solar system and neighboring stars -- neighboring planetary systems in search for what might be the source of that panspermia, and if we find such a source and we're able to demonstrate scientifically that it was somehow involved in the migration of life to earth, that indeed would be a scientific test. So it's a scientific statement, but it's one that's going to be really hard to test.

Page 189

Q. Could not that concept of the panspermia also be the concept behind intelligent design, meaning not the simple life forms apparently that Crick had in mind but certainly something more complex that would be compatible with the design hypothesis?

A. I honestly don't think so, and the reason I don't think so comes from simply listening to intelligent design advocates, and what they say is that new organs, new structures, new chemical pathways and new organisms were produced by the actions of an intelligent designer acting outside the laws of nature, and any actions that exist outside the laws of nature are by definition not testable by the methods of science.

Q. If it didn't require the supernatural but could rely on the panspermia, could intelligent design be considered a scientific hypothesis?

A. Again, I don't understand your question because you say if intelligent design didn't require the designer acting outside the laws of nature, which, of course, it does, and intelligent design relied on panspermia, but panspermia is an entirely different idea from intelligent design.

Page 190

Panspermia is the idea that the simple organisms that first appear on this planet about three billion years ago might have come from outer space. That's the idea of panspermia. Those simple organisms didn't have bacterial flagellum, they weren't eukaryotic, they didn't have eukaryotic cilium, they didn't have a blood clotting cascade. They didn't have eyes. They didn't have the complexity of the human genome.

If intelligent design is required, as its advocates say it is, to have produced each of those things from the simple organism that first appeared on this planet three billion years ago, then panspermia, which only accounts for the first appearance of the simple organism, would be completely inadequate to explain the structures, organs and systems which intelligent design propose. So I don't see the relationship between the two.

Q. Now, Crick invoked the panspermia because of the complexity of DNA; is that correct?

A. I actually don't know why Francis Crick became a fan of panspermia. I can suggest that Francis Crick, just like myself, regards the origin of life as an unsolved scientific problem, and I do

Page 191

know that Francis Crick was aware that a number of meteorites that have fallen to earth. The Murchison meteorite in Australia is a good example.

Many meteorites when they fall to earth turn out to have substantial traces of organic compounds in them. So it's very clear that the ability to form organic compounds exists throughout our solar system at the very least and not just on planet earth. And perhaps Crick thought well, the origin of life is an unsolved problem, organic compounds are abundant elsewhere in the solar system. Perhaps life originated elsewhere under different conditions from those we have on earth and then spread to this planet by comets or meteorite, and I think, as I understand it, that's the essence of Crick's idea.

Q. Now, would the material that came that sort of was the origin of the life would it have necessarily contained DNA?

A. All living things that we know contain DNA, and I'm pretty sure that Crick would have imagined that that compound would have had DNA, as well -- that those organisms would have had DNA, as well.

Page 192

Q. Does not DNA contain all of the necessary coded information for the development of the organism?

A. No.

Q. What's missing?

A. DNA itself is incapable of its own replication, is incapable of expressing genetic information, is incapable of establishing a metabolic system. So DNA requires a whole set of enzymes, RNA, cell membranes and various other structures to enclose it in sort of a metabolic web that makes the persistence of life possible.

Q. Did those other components then arrive through this panspermia along with the DNA?

A. Are you asking what I think or are you asking me what Dr. Crick thought?

Q. Well, what you think and if it's different than what Dr. Crick thought.

A. What I think is that panspermia is an unnecessary idea. It's certainly a possibility, but I see absolutely no reason given what we know about the history of life on earth to assume that life originated anywhere other than this planet. So that's not an idea that I hold to. I'm not an

Page 193

expert on what Crick thought or why he thought it, but my understanding is that when Crick talked panspermia, he was talking about living cells being scattered to the earth on comets or meteorites. So he thought the whole package was a complete living organism.

Q. Now, again, going back to your claim that intelligent design is not science, you mentioned testability, but I want to ask you about the specific criteria that you rely on to determine whether something is or is not science, and I believe testability is perhaps one of those that I gathered from your report or at least the one that sort of jumped out at me. Is that accurate; is testability one of the criteria used to determine whether something is scientific or not?

A. Yes, it certainly is. I think most scientists would probably -- I don't know if I'd used the word testability in my expert statement or not, but one of the ways in which most scientists would put it is falsifiability, which is to say any scientific -- any truly scientific hypothesis must be falsifiable. There must be a way to test it.

Q. Is testability different from

Page 194

falsifiability?
A. Probably not. I don't see like to split too closely on the meanings of words.
Q. I'll just refer you to page 11 of your report, which is marked as Exhibit 4, I believe. The third full paragraph about midway through it says, "Since the design explanation is not testable, it falls outside the realm of science and places it in the realm of theology, where non-natural explanations are an accepted part of the explanatory landscape." So in your report you use the word testable.
A. Yes, but I didn't use the word testability. I'm sorry. I warned you I tend to be very literal.
Q. Fine. So you used testable as a criteria. Are there any other criteria that you used to determine whether something is scientific or not?
A. Other criteria that one might use to determine if something is scientific or not?
Q. And my question directly is you.
A. Of course. I understand. No, I'm just flipping through here for inspiration, as much as for anything else. First and foremost a scientific

Page 195

statement has to be about nature to be scientific, and it has to refer to a portion of the natural world that is observable or potentially observable, and it has to be proposed in a way that is testable or falsifiable. I use those two words to mean the same thing. So I think that's a fair statement as to how you decide if a statement is a scientific statement or not.
Q. So, in essence, you -- in essence have three of them must be about nature to be scientific?
A. Yes, and the reason I say about nature or about the natural world is the predictions that you and I might make about the outcome of a football game or whether or not we will like a movie that we will go to see tonight. These are not statements really about the natural world, so they're not scientific statements. Science by definition, I think, is our attempt -- our organized attempt to understand the workings of nature.
Q. Are you familiar with the term methodological materialism or methodological naturalism?
A. Are you asking me have I heard of the term?

Page 196

Q. Yes.
A. I actually haven't heard of the first one, but methodological naturalism, yes, I have heard of that.
Q. Is that a term that regulates whether something is science or not science?
A. Well, I suppose so. Again, as I said, I am not an expert in the philosophy of science, and I will tell you what I understand the term to mean and how it applies to that definition. Methodological naturalism means that the methods of investigation that we use to investigate the natural world themselves involve natural mechanisms. So, in other words, we try to understand why the sun appears to rise or set, why a flower unfolds or how a fingernail grows by looking at the natural world, the material of which the universe, the flower or my thumb are composed in seeking explanations by using the method of natural explanations for natural phenomena. So that's how I understand methodological naturalism, and that's an important part of science.
Q. Is that different from your first two criteria, which seem to be interrelated, meaning be

Page 197

about nature to be scientific, refer to a portion of the natural world that's observable?
A. I think it's sort of implied in those first couple. I think they sort of run into each over.
Q. Are there any differences?
A. There might be, but none that come to my mind right now.
MR. WALCZAK: Take a break?
MR. MUISE: Sure.
(Recess.)
BY MR. MUISE:
Q. Before we broke, we were talking about -- is it methodological naturalism that you're familiar with that term?
A. Yes, I am familiar with that term.
Q. And I believe you said it was consistent with the two criteria that you describe with regard to the reference to nature?
A. Yes, I did. Let me put it another way. Earlier today I defined science as the systematic search for natural explanations for natural phenomenon, and the whole idea that you search for natural explanations for natural phenomena, that is,

Page 198

in fact, methodological naturalism, and so it fits very much in with the working definition of science.

Q. Is that separate from the criteria of testability and falsifiability or --

A. Well, it's actually hard to say. I would put testability and falsifiability under that first part, which is the systematic search. What do you mean by a systematic search? Well, one could come up with a natural explanation for this or that or the other thing but unless those natural explanations were also testable -- and that's what I mean by systematic search -- they wouldn't be of much use.

Q. Is the concept of methodological naturalism is that itself testable?

A. The term methodological naturalism means that in seeking explanations for natural phenomena, we seek them in the natural world because that's where the phenomena come about to begin with. What enables us to prefer one explanation over another -- in other words, the way in which we rule out one natural explanation or another natural explanation for a specific natural phenomena, that's where

Page 199

testability or falsifiability comes in.

Q. Are there any -- and I use this term higher order phenomena. Are there any higher order phenomena that can't be accounted for in any of these sort of terms of a reductive materialism with reference to the material in the natural world?

A. Wow. I'm sorry. I don't understand what you just asked.

Q. Okay. Well, intelligence -- is intelligence -- is that a higher order process that is detectable in nature?

A. I'm not a psychologist or a cognitive psychologist, but my understanding is it's very hard to define exactly what intelligence means. So perhaps you could be more specific. Do you mean they'll do mathematics to compose a symphony, to hit a 30-foot jump shot? What do you mean by intelligence?

Q. How about the ability to design?

A. Design what?

Q. Design the basic features of living organisms?

A. Oh, well, that's the kind of intelligence that I don't know anything about because I don't

Page 200

know anyone who is able to define the basic features of living organisms.

Q. But is that the sort of phenomenon that you believe is detectable in nature or not?

A. I have to say again I don't quite understand what you're asking me. Earlier on you asked me whether or not design by an outside agent, intelligent agent, would be detectable in nature, and we went through a detailed analysis of this in which I essentially said no, I don't think so because in order to attribute the existence of a certain kind of order to design, one would have to rule out all possible natural possibilities, and I don't understand how you do that.

Q. So you see the two as not being -- as being mutually exclusive?

A. I have to say I don't understand what you're getting at.

Q. Okay. Do you know what the scientific status of methodological naturalism presently is?

A. I would say that methodological naturalism, in fact, describes science, that the technique we use to conduct scientific explanations -- scientific investigation and to

Page 201

build scientific explanation, that technique is called methodological naturalism.

Q. Is that a philosophical proposition?

A. The -- only in the broadest and most general sense there is a school of thought called philosophical naturalism, which I am indeed familiar with, as well, which is quite distinct from methodological naturalism as it's applied to science. Now, perhaps what you're getting at when you say is that a philosophical school of thought is indeed that. And philosophical naturalism, as I understand it, is essentially the proposition that the material world of nature is all there is. That everything that we are, everything in the universe can be explained in terms of matter and energy, and that's what I understand as philosophical naturalism. I think any person who believes in a supreme being or thinks there is a spiritual reality as I do is a person who does not ascribe to philosophical naturalism.

On the other hand, as a scientist I certainly do ascribe to methodological naturalism, and to sort of couch all of this, if you will, in a larger theological perspective, my compass for

Page 146

Q. But is it not true that you could detect design in nature and infer intelligence from that without having to refer to God as being that intelligent source?

A. Could you help me to understand your question by saying what do you mean by detect design in nature? I'll give an example of why I ask that question. If you were to make a snowflake and put it under the microscope, you would discover this absolute intricate pattern, and you would say wow, some great artist must have sat here and tooled this out with a laser cutter or something like that. But as you and I know, a snowflake grows absolutely naturally by the phase transition of water vapor into the solid phase of water into ice and that the little angles and cuttings and so forth on the edges of a snowflake are actually determined by the way in which water molecules line up together when they go into a solid state.

So you might look at a snowflake and say I detect design, but, of course, you'd be wrong. You'd actually be looking at the playing of laws of chemistry and physics and not a specific design. So you have to help me in terms of what you mean by

Page 147

detecting design in nature.

Q. Well, if I'm not mistaken, didn't Richard Dawkins -- he refers to the design in nature as apparent design; is that accurate?

A. Which of Dawkins' books are you referring to?

Q. I believe it's in "Blind Watchmaker." I may be incorrect.

A. Okay. I haven't read "Blind Watchmaker" for a few years, but I think your characterization of what he wrote is accurate, which is to say that Dawkins at the early pages of that book says that yes, when you look at the -- structure and function. When you look at the anatomy of living organisms, one impression that you can get is that living organisms appear to have been designed or engineered for specific purposes.

Q. Well, isn't one of the -- part of the nature of the controversy is whether this design is an apparent design or real design?

A. Yes, I think it is fair to say that is part of the nature of the controversy.

Q. So then going to my question is it possible then to detect design in nature?

Page 148

A. Is it possible to detect design in nature? Well, first of all, based on what Dawkins said, it certainly is possible to detect apparent design. But if you read the "Blind Watchmaker," which I'm sure you have, you know that what Dawkins shows quite eloquently in "Blind Watchmaker" is that even very intricate physiological systems which have the appearance of design, when you actually examine them, you discover that that apparent design has been produced by the process of evolution. So it turns out not to have been design at all.

So to, as you put it, detect design in nature, one would basically have to rule out any possibility that the apparent design could have been produced by a natural process like evolution. How you rule out any possibility of the natural generation of that design by evolutionary processes is really at the heart of the problem faced by intelligent design advocates, which is they have never really shown any direct way to show that any characteristic in any living organism is the product of design.

Q. Is that not the sort of the foundation of the concept of irreducible complexity is to

Page 149

demonstrate that through scientific experimentation?

A. I agreed with you right up to experimentation. I am unaware of any experiment that Dr. Behe, Dr. Minnich or anyone else has done that has supported irreducible complexity. So chopping off that part of your question and saying isn't that the point of the argument for irreducible complexity, the answer is yes, that is the point of the argument is to say that an organ system or structure that is irreducibly complex could not have been produced by an evolutionary process.

But as I explained to you in an answer to an earlier question, once the definition of irreducible complexity is modified, as Dr. Behe has modified it, to say that well, an irreducibly complex system can contain functioning subsystems, you've then blown the entire argument because you then provide a step-by-step pathway or you make it possible for a step-by-step pathway to account for the evolution of those structures.

So, you know, as I pointed out in my essays on this topic, I think the idea of irreducible complexity has either failed outright or

Page 150

has saved itself only by redefining what that term means so radically that it no longer stands in contradiction to evolution. That's the intent of the irreducible complexity argument, but it's an argument that fails.

Q. But it's one -- it's an argument that you've tested through scientific evidence and have demonstrated that it fails?

A. I believe I have and not by experiments that I have done myself but simply by looking at the scientific literature, and a perfectly good example of that is, in fact, the bacterial flagellum itself. When it was originally raised by Michael Behe in his book, "Darwin's Black Box" as an example of irreducible complexity, he basically claimed that all of the proteins in the bacterial flagellum had a single function, and that function was the movement of the flagellum, that none of these proteins would function if so much as one of them were taken away. Therefore, they all must have been designed together as a single package.

About a year or two after the publication of this book, scientists became aware -- this is not work I did, but it certainly is work I have read.

Page 151

Scientists became aware that about ten of the proteins in the bacterial flagellum were very strongly homologous to a biochemical apparatus known as the type III secretory system. Once that was discovered, it was immediately clear that the bacterial flagellum, in fact, was not irreducibly complex by Behe's own terms because a subset of its parts has another different but perfectly valuable function within the context of a living cell.

Q. One of the things that seemed to have occurred to me as I've been looking at what the experts have written that many of you will be pointing to the same or similar scientific literature and then drawing various conclusions or different conclusions from that. Is that too broad of a statement or is it a fair statement?

A. I'd have to know specifically what literature you're pointing at to say yes or no to that.

Q. Let me get right to another question then. You took issue when I ended one of the sentences with scientific experimentation. You said that you're not aware of any experimentation to demonstrate irreducible complexity; is that --

Page 152

A. That is correct. I'm not aware of any experiments that demonstrate irreducible complexity performed by Dr. Minnich, Dr. Behe or anyone else.

Q. Now, your arguments against irreducible complexity aren't based on any experiments that you've done, but you looked at the scientific literature to support your arguments against it; is that correct?

A. That is also correct.

Q. Is that not the same thing that Michael Behe and others have done, is that they point to scientific evidence and then draw conclusions from that scientific evidence to support their conclusion of irreducible complexity?

A. Well I think what you're focussing on with your question is process. I think it's perfectly fine for Dr. Behe, Dr. Minnich, Dr. Wells or any of the advocates of intelligent design to point to the scientific literature, to point to observations and experiments that have been done by other people in other laboratories, have been peer reviewed and have been published and to cite that evidence, cite those data, those experiments in their own arguments; and furthermore, it's perfectly okay for me to do

Page 153

exactly the same thing.

The question at issue is not whether or not I have done experiments in my own laboratory that have produced that evidence or Dr. Minnich or Dr. Behe have done experiments in their own laboratory that have done it, the question is whether or not the inferences that they draw in their analysis are correct or not, whether or not they're supported by the evidence.

And in the case of irreducible complexity, it's important to keep in mind that the formulation of irreducible complexity in Dr. Behe's own words made a specific prediction, and that prediction which I read to you earlier and put in the expert statement is that any irreducibly complex system that is missing a part is by definition nonfunctional, his terms, his claim, his words.

When I was able to look in the literature and discover that the type III secretory system which is missing 20 to 25 parts, not just one, but 20 to 25 parts from the flagellum, is not nonfunctional, to use a double negative, but is perfectly functional, the central claim of irreducible complexity was disproven.

Page 234

and telling students repeatedly that evolution is antithetical to the Christian faith; therefore, is not to be believed; and therefore, science is something that is dangerous to believe.

Q. And as you pointed out, it's your understanding that Dover High School, they obviously are teaching out of your textbook pursuant to the Pennsylvania state standards, correct?

A. That's my understanding.

Q. Now, is testability a symmetrical proposition, meaning can you test the negation of a proposition?

A. Hang on for a second. It's getting late in the day so -- can you test the negation of a proposition? In other words, can you test to see if a proposition can be contradicted; is that what you mean?

Q. I can give you some examples.

A. Oh, please do.

Q. The proposition that humans and other primates share a common ancestor; is that a scientific proposition?

A. Yes, it is, and it is testable.

Q. Is the negation of that proposition

Page 235

testable?

A. And the negation would be that humans and primates do not share a common ancestor.

Q. And I believe in logic they say is it not the case that human primates share a common ancestor?

A. Sorry to interrupt you. Very often in mathematical proofs you assume the negative and see where it leads, and if it leads to a contradiction, that's a way in mathematics of proving the positive. The notion -- I'll try to answer the question in the most straightforward way I can. The notion that humans and primates share common ancestry leads to a number of testable predictions, and one of those testable predictions is that we should be able to trace our genetic material back to a common ancestor. Now, what are the implications of that?

Well, one of the implications, which is very clear from genetics, is that molecular errors, mistakes in DNA, which build up from time to time, if those mistakes occurred in the DNA of a common ancestor, those mistakes ought to appear in our DNA, and they also ought to appear in the DNA of our primate relatives.

Page 236

Now, I emphasize mistakes because mistakes by definition are random, accidental and of no functional significance. It turns out, as you may know -- and I'd be glad to elaborate if you'd like a specific example -- that our genomes contain a number of what are know as mobile genetic elements, which are basically the scars of viral infections, viruses that have inserted themselves into our DNA.

And in many cases in the human genome, when our genome is compared to that of the chimpanzee and the gorilla, we find these molecular scars in exactly the same places between exactly the same genes. If -- and this is proving the negative -- if we do not share a common ancestry with these organisms, there is absolutely no way to explain these shared common mistakes. If we do share a common ancestry with them, they are easily explained, which is to say that the viral infections, the genetic mistakes, the errors occurred in that common ancestor, and the reason we have them in the same spot is because we've shared common ancestors.

In a way this argument is not unlike the way I caught a couple of students testing -- a

Page 237

couple of students cheating on a final exam a few years ago. I could see two students obviously copying from each other's papers, I knew who they were, I waited until the exam was over, and when the exams were collected, I looked at their names and I look at their papers and it was obvious that they had copied from each other. So I called the students in, and I asked them if they had indeed copied from each over and cheated on the exam. And at first they just protested, and they said well, prove it. You have no evidence that we copied. I said look at this essay question on your two papers. It's almost identical. They said of course it's identical, we studied together. So we have the same understanding of material. I said that's not what I'm talking about. You misspelled the same five words in the same five ways on these two papers. Common errors indicates common ancestry, and at that point they threw their hands up and threw themselves on the mercy of the court.

We share common molecular errors with our primate relatives, and the only explanation for that is common ancestry. To take the exact question you asked, the hypothesis of separate ancestry

Page 238

confronted by shared molecular errors in the same positions is disproven.

Q. The explanation you gave about the genetic scars, is that similar to the controversy with regard to the molecular clock and I believe that has to do with sequencing proteins. Are they the same thing or two different things? Are we talking apples and oranges?

A. It's not similar. They're two different things.

Q. At the end of that very long and interesting explanation, the negation of the proposition is a scientific hypothesis?

A. Yes, I believe it is.

Q. And I think you probably answered this in the subsequent part, the latter part of your explanation, but the same proposition, all organisms on earth share a common ancestor, the negation of that proposition would be similarly a testable hypothesis based on your prior answer?

A. Well, let's take the negation of that. The negation of that proposition would be -- I'm not sure what the negation would be. Would it be that all organisms have unique ancestries?

Page 239

Q. Or it would be it's not the case that all organisms on earth share a common ancestor?

A. Okay. Well, that proposition would be difficult to falsify if only because that would be correct if 99.99 percent of organisms had a common ancestry and there was 1,000th of 1 percent that didn't. So it would be -- those two hypotheses are so close in terms of their predictions. They would be difficult to distinguish.

But if, for example, we were to set this up in a more useful way, which is to say is it possible -- let's take, for example, the major groups of living organisms. Let's take, for example, the three great domains of life, eubacteria, e-u-b-a-c-t-e-r-i-a, archea, a-r-c-h-e-a, and eukaryea, e-u-k-a-r-y-e-a -- no, it's spelled e-u-k-a-r-y-a, eukarya. If we present it as the alternative hypothesis that these three domains of life have separate and common ancestries, that is indeed a testable hypothesis.

MR. WALCZAK: It's separate and common?

THE WITNESS: Excuse me, it's separate ancestries as opposed to common ancestries, that is indeed a testable hypothesis. Now,

Page 240

I'm by no means an expert on what's known as studies of the tree of life, but my own understanding is that there is abundant molecular evidence that the DNA of eukaryotic organisms is very, very closely related to the archea; and therefore, the hypothesis that ancestry is separate between these three domains can be tested, has been tested and has been falsified.

Now, in terms of other possibilities for separate ancestry, there is an infinite number of possibilities. So one would have to be specific about what the alternative hypothesis is.

BY MR. MUISE:

Q. Well, the fact that you might have an infinite number of possibilities doesn't negate the fact that it is a scientific hypothesis?

A. Yes, that's correct.

Q. How about this proposition? Is this a scientific proposition that life on earth arose by material causes?

A. Yes, I think it is.

Q. Is the negation of that proposition a

Page 241

scientific hypothesis?

A. There are several negations of it, and some are scientific and some are not. The ones that are scientific are the panspermia arguments, which is that life on earth arose from material causes at another place in the solar system or the universe and spread to earth. That's a scientific proposition. It would be very difficult to test, but it would be possible, as we discussed earlier, to test it in principal.

The alternate, which is I think the alternate you wish to ask me, which is that life arose on earth but was the result of nonmaterial causes acting outside of nature. That's not a scientific proposition because by definition if the causes were not material, they exist outside the methodology of science, and therefore, they cannot be tested.

Q. The original proposition that we began with, life on earth arose by material causes, and you said is a scientific proposition?

A. Uh-huh.

Q. How would you go about proving that?

A. I'll reiterate something I've said

Page 242

repeatedly throughout the morning and afternoon, which is science doesn't prove things. The way I would go about testing that idea is basically the way the origin of life researchers have worked at it for the last several decades, which is to try to investigate whether the basic building blocks of living molecules can be generated or could be generated spontaneously by conditions that resemble those on the primitive earth. By-in-large that question has been answered in the affirmative.

The next step would be to try to understand how and whether or not those building blocks could themselves spontaneously assemble into small, catalytic, self-replicating molecules. That step of the analysis by-in-large has not been completed. We don't have good explanations how that could have happened. We do know that small RNA molecules are catalytic and can be self-replicating, but we don't know where they first came from.

So I think the way in which you test that is by simply trying to investigate every stage of what one thinks is a reasonable natural set of hypothesis for how this might have come about and investigating them. And as you know, if you've read

Page 243

our textbook, our textbook very clearly presents the origin of life as an unsolved scientific problem.

I believe it mentions that the step from a collection of nonliving molecules to a living cell is the greatest gap in our understanding of life's early history and that this is a question that science cannot yet answer, and I think that's by far the best way to represent it to students.

Q. And I believe in your report you set out three primary or main propositions of the theory of evolution. Let me see if I can summarize those. The first being change over time, the second being common descent -- and I'm not sure if I have them in correct order -- and the third being the mechanism of evolution, principally natural selection?

A. I actually stated -- the first two I think you summarized just fine. The third one I stated a little more broadly than you just did. The third element of the theory of evolution is the proposition that biological change over time is driven by forces observable in the world today.

Q. Is that mechanism the mechanism of natural selection?

A. I'll read from my statement because I

Page 244

think this says it well. "Evolutionary biologists have confirmed the process of natural selection through direct observation but have discovered that other processes are also important in evolutionary change. These include genetic drift, the so-called founder effect, genetic recomposition -- sorry, genetic recombination, transposition and horizontal gene transfer between species." I've been reading from page three of my expert statement.

Q. Are all of those that you just described mechanisms of evolution?

A. All of those are contributing processes that drive evolution. I think that answer, therefore, is yes.

Q. Are they separate and distinct from the mechanism of natural selection or are they part and parcel of the mechanism of natural selection?

A. That's an interesting question. Let me think about that just for a second. Genetic drift is -- genetic drift and the founder effect are certainly distinct from natural selection in that they drive genetic change in a way that it is not selective. Genetic recombination, transposition and horizontal gene transfer are responsible for a large

Page 245

part of the variability within a species that natural selection acts upon. So none of the effects that I've just mentioned are natural selection per se. They all exist in a mechanism of which they and natural selection are a part of.

Q. When you say all, the genetic drift and the founder effect you distinguished out as being separate from natural selection?

A. Yes, I did.

Q. And the all that you just referred to in your answer, is that the all, meaning the subsequent ones that you identified on the list?

A. Yes, that's correct. The subsequent ones that I identified, which for the sake of the stenographer I will not repeat, produce variability in a species, which natural selection can act upon.

Q. Now, with genetic drift and the founder effect is not natural selection operating within those concepts, as well?

A. Well, it's important to understand exactly what they mean. The founder effect essentially describes the fact that the founding population in a new habitat, a new island, a volcanic island in the middle of the ocean, a mountain peak that has been

Page 246

ravished by fire and now is repopulated by a species, the founding members of the new colonizing population if their genetic characteristics are dramatically different from those of the population as a whole can influence the characteristics of the new population in a way that is not acted upon by natural selection.

To give you an example, red hair is a comparatively rare trait in our species. If a new island popped up in the middle of the ocean and was populated by a shipwreck of human beings of whom all four or five turned out to have red hair, suddenly a new population might well grow up of red-haired people over many generations not because there was any selective force favoring red hair but simply because of the characteristics of that founding population.

So the founder effect and genetic drift, which is sort of subsumed within that, is a force that can change the overall characteristics of a species due to effects that have nothing to do with natural selection.

Q. But isn't natural selection still operating on that island, except it's having less to

Page 247

select from?

A. Natural selection is a force that operates in nature everywhere all the time. So it certainly is going to act on that island, but the reason the island wound up with nothing but red-haired people has nothing to do with that natural selection and has everything to do with the founding members of the population.

Q. Now, looking at those three propositions that you outlined, the first one evolution being change over time. Now, that's a proposition would you agree that ID advocates don't dispute?

A. Some do. Paul Nelson from the Discovery Institute is a good example of someone who disputes it, but it is also true that many other ID advocates do not dispute it.

Q. I've often read or seen where people are comparing evolution to whether it's a theory or effect, and I think Michael Behe pointed to some article by Michael Ruse where he said evolution is a fact. Is evolution a fact?

A. It depends on exactly what you mean by evolution. I often think that in English where we tend to use terms for several things that we use

Page 248

evolution in two entirely different ways, and it would be very good if we could come up with different words so we wouldn't confuse the two meanings.

So, it is a fact that life on this planet has changed over time. It is also a fact that the pattern of life which we observe in the fossil record follows a pattern that we call descent with modification. In other words, when we look in the fossil record, we see everywhere a series of ancestor descendent relationships. When new living organisms appear, in almost all cases they clearly are modified versions of the forms that have preceded them in the fossil record, and that is what is meant by descent with modification.

Now, if you apply evolution to that, it is a fact, and I think you've just suggested that ID people think it's a fact, too, that life has changed over time, and it is a fact that the life of the past has changed into the life of the present. So in that sense, evolution is as much of a fact as anything else we know in any science or anything we know in natural history.

If, however, by evolution you mean the

Page 249

process in a biological and material sense that produced the change over time, that's where evolution is a therapy, and evolutionary theory is a set of explanations that are based in genetics in this century, molecular biology, physiology and developmental biology that seeks to explain how that change took place.

And since evolution is a set of explanations that explains an entire range of observations and natural phenomena, that's the sense in which evolution is a theory.

Q. Now, with regard to the propositions that you stated, the first one change over time, is that the first sort of historical acknowledgment one that some would claim is a fact? Is that the evolution that you're referring to?

A. Yes, that is the first sense in which I referred to evolution, and one of the points I made in the expert report is that the fact of change over time was recognized long before Charles Darwin wrote the "Origin of Species."

Q. I take it there's not much dispute in the scientific community over evolution being change over time?

Page 250

A. I don't think there's much dispute at all in the scientific community over evolution, period, and certainly not over evolution being change over time.
Q. Do you know if Michael Behe disputes the notion of evolution, as you stated in your first proposition, change over time?
A. I would be more comfortable if you asked Dr. Behe that question. I don't think he does, but I don't want to answer for him.
Q. When you said you don't think he does, why is it that you don't think --
A. Because I have debated Dr. Behe six or seven times, and he's never disputed that point. He's never -- he's never brought the point up for discussion. So I don't know if that's his opinion or not, but he certainly has never argued about it.
Q. Did you read his expert report?
A. Yes, I did skim through it. I have to confess that I didn't read every page carefully, but I read most of it.
Q. Did you read the part where he was explaining where intelligent design advocates have their greatest controversy with those who advance

Page 251

the theory of evolution?
A. I don't recall it.
Q. If Michael Behe -- and this is obviously a hypothetical because you don't know -- I can represent to you in his report he stated that he does not have a problem with the idea that evolution has changed over time. His dispute is principally with the mechanism of how the change actually takes place.
I've seen in the literature and in the expert reports that have been presented that they cast ID advocates as anticvolutionists, and what appears to be, as we've stated, it's important to have a proper definition. Would it be improper if Michael Behe agreed that evolution has changed over time, is it proper to cast him as an antievolutionist?
A. Yes, it is, and remember that I said we often in English use the word evolution to refer to two different things, and one was what I called the fact of evolution -- and let's just call that descent with modification to distinguish it from evolution -- and that's the part with which Michael Behe has never said, even by the words you just

Page 252

quoted, he's never said he agrees. He just said he has no problem with. That to me doesn't sound like a ringing endorsement.
But the second part, which is how that change takes place, that's evolutionary theory. If I remember from "Darwin's Black Box," I believe Dr. Behe wrote something along these lines -- and this is probably not an exact quote, but it's as exact as I can get from my recollection. He wrote, "For the Darwinian theory of evolution to be true, it must explain the biochemical complexity of the living cell. It is the purpose of this book to argue that it does not." And on that basis, I think it is fair to characterize Michael Behe as antievolutionist because, as his own words said, he wrote a book to argue that the Darwinian theory of evolution is not true, and to me that would make anyone an antievolutionist.
Q. Is it your understanding that he was seeking to disprove proposition number one referring to your report?
A. The language that I just quoted from Dr. Behe, my understanding is that he was not trying to disprove what you are calling proposition number

Page 253

one, but rather he was trying to disprove proposition number three. Since all three propositions are part of evolution, that would make him an antievolutionist.
Q. Are all three of those propositions that you describe in your report, do they have a similar consensus amongst the scientific community?
A. Yes.
Q. So, for example, the mechanism of evolution -- I'll call that proposition number three, if, I have the number correctly?
A. Yes.
Q. The consensus in the scientific community for the mechanisms of evolution, you're saying is the same as the consensus of the scientific community for proposition number one, that evolution has changed over time?
A. Yes, it is, if you actually read my proposition number three, because proposition number three -- I'll quote it again -- "The third element of the theory of evolution is the proposition that biological change over time is driven by forces observable in the world today." Is there a consensus in the scientific community on that point?

Page 254

I think the answer is overwhelmingly yes.
There may be disagreement as to what those forces are, but I know of no disagreement in the scientific community that the forces that drove it are observable in the world today.
Q. So disagreement over what those forces presently are?
A. Yes, and let me give you -- let me volunteer an example of that. Evolutionary biologists will look at various forms of natural selection. They may look at sexual selection, physiological selection, natural selection as it relates to predator prey or reproductive success, and some may argue that physiological selection is more important than sexual, and others may say no, sexual selection is more important than anything else, and they may have different investigations or observations to back up their claim.
The common point upon which there is enormously broad consensus is that the mechanisms that drove evolutionary change, proposition number one, are observable in the world today, and that's proposition three, and do not require the supernatural creative intervention of an intelligent

Page 255

designer, and I think it is very fair to say that that is indeed the scientific consensus.
Q. Is it fair to say that there is dispute within the scientific community as to what those mechanisms are, though?
A. I'll say it again. There is absolutely no dispute within the scientific community that biological change over time is driven by the forces we can observe in the world today. There is within the community of evolutionary biologists disagreement as to the exact balance of which forces shaping natural selection are the most important, and I will volunteer another example. The well-understood changes in color of the peppered moth biston, b-i-s-t-o-n, betularia, b-e-t-u-l-a-r-i-a associated with industrial melanism were once thought to have been driven by what evolutionary biologists called predation selection, and predation selection in this case means the visibility of the moths on various backgrounds to birds of prey.
A reexamination of this basic work has made it clear that the people who did it didn't rule out the possibility that besides visibility to birds

Page 256

of prey, other factors such as migration, sexual selection or physiological selection might also have been at work, but there's no disagreement among people who have studied the change and color of the moth that the forces that caused it were indeed natural forces observable in the world acting today amenable to testing and experiment and therefore amenable to scientific investigation.
Q. Are all of those considered Darwin's theory of evolution or are you just making a general statement of these mechanisms are --
A. It depends on exactly what you mean by Darwin's theory, and both biologists today take an expansive view of what is meant by Darwin's theory. Darwin, for example, understood physiological selection, he understood sexual selection -- in fact, he was the first person to point it out -- and he certainly understood predation selection and migration. All of those forces clearly are at work in the change in the color of the peppered moth that has been observed over time. So are all of those part of Darwin's theory? Yes, I think they are.
MR. MUISE: Can we mark this, please?
(Recess.)

Page 257

BY MR. MUISE:
Q. Let's go back on the record. I want to talk about the second proposition, and that would be common descent, according to your report.
A. Yes.
Q. Does common descent have the same consensus in the scientific community as the other two propositions of change over time and the mechanism of evolution?
A. Yes, it does with one provision, and that is it's very clear from genetic studies of microorganisms that a process that was not suspected until about 20 years ago played a very, very important role in the early history of microbial life, and probably still plays an important role, and that process, which I've already referred to today is called horizontal gene transfer, and that is bits and pieces of DNA move quite easily from one microorganism to another, and that has made it difficult at the level of microorganisms to trace common descent through bacteria and through single-celled organisms.
The general view that is held by a consensus of biologists is that common ancestry

Page 202

guiding the relationships between these is pretty well exemplified in that document written by John Paul II that I mentioned earlier called Fides et Ratio, which is to say that the rational world of science can be included in the faith world of religion, and the two are entirely compatible. That's what makes me a methodological naturalist insofar as I practice science, and that is also what does not make me a philosophical naturalist in terms of saying that mere matter is all there is.

Q. Let me ask you a question. I'm going to read to you a statement that was -- and I'll represent to you is from John Angus Campbell, Ph.D., his expert report submitted in this particular case. I'm just going to -- I'll read you this statement, and then I'm going to ask you -- actually, I think it's a couple of sentences -- but ask you if you agree or disagree with --

A. After you read it and before I answer, may I take a brief look at the statement, so I can see the context?

Q. Certainly.

A. Okay.

Q. And the statement is "A present reader, however, may conclude that ID is not science because it draws an inference to an unobservable nonmaterial cause. Yet that reader has no greater certainty to be consistently comparative about it in the most ardent ID advocate that such a conclusion will be acceptable to scientists or philosophers of science in 100 years or for that matter, in 25 years, 10 years or next week." It's the first highlighted.

A. Okay. It was very helpful to look at the paragraph, the context in which you read this, because the first part when you said a present reader, I had no idea what that meant, and of course, it means a present reader in contrast to someone reading Darwin's "Origin of Species" in 1859. And what the statement points out was that there is a claim here that Darwin learned scientific method and logic from John Herschel's Preliminary Discourse, and that this book, which I'm not familiar with, legitimated the design inference as one of the highest motives for discussing science.

That statement is very much in mind with what I know of the Natural Theology School of the late 18th and early 19th century, which is that one of the motivations for studying nature and understanding nature was to confirm for the greater glory of God the wonder of his works in nature, and it certainly is easy for me to believe that this book, which I have not read, made exactly this point to Charles Darwin. The quote you asked me to comment on, "A present reader, however, may conclude that" --

THE COURT REPORTER: Can you slow down?

THE WITNESS: Of course. It was very discourteous of me to forget about you.

A. The quote that you asked me to comment I'll read it in part and then make comments on it. "A present reader, however, may conclude that ID is not science because it draws an inference to an unobservable nonmaterial cause," and I would take issue with that statement because it's not just that ID draws an inference to an unobservable material cause, but ID basically puts its whole case on an unobservable material cause.

Remember that ID stands for intelligent designer, and the intelligent designer in this case is the author of all things not attributed to evolution. So it doesn't just infer it, it basically builds its entire hypothesis about this unobserved nonmaterial cause.

Then the statement says, "Yet that reader has no greater certainty than the most ardent ID advocate that such a conclusion will be acceptable to scientists or philosophers of science in 100 years or for that matter, in 25 years, 10 years or next week." Now, the point that that sentence seems to make to me is that since the time before Darwin, science apparently has changed its mind about whether a reference to supernatural design is acceptable as part of science, and I think that certainly is true.

It is true, for example, that in the middle ages, in the 1200s and 1300s, supernatural causes were accepted as explanations for disease, as explanations for the phases of the moon, for the movements of tides, for earthquakes, for floods and all manner of phenomena. These inferences I would argue are relics from the prescientific age prior to the scientific enlightenment. And I would also argue that insofar as this is a fair summary of John Herschel's book on Preliminary Discourse that the design inference he draws in here is also a relic of a pre-enlightenment, prescientific age view of

Page 206

science in which supernatural explanations were sought for natural phenomena.

So the second sentence, which you quoted, meaning that science has changed its view about supernatural causes in the past and it may well change it in the future is one about which I would be very doubtful. So, in other words, this is not a statement that I would endorse, and it's one that I would take issue with.

Q. And let me ask you about a second sentence in this same report, and it's quote, "The present regime of methodological rules cannot prevent controversy for the simple reason that those rules may themselves be one of the subjects of scientific controversy." Do you agree with that statement?

A. No.

Q. Why not?

A. I don't agree with that statement because I am unaware of any controversy at all within science itself over the application of methodological naturalism, which we also sometimes simply call the scientific method.

Q. What about controversy over demarcation theories?

Page 207

A. You'll have to help me out here. Tell me what demarcation theories are.

Q. Well, demarcation criteria for determining whether something is science or not science, such as the famous test that was -- that presented apparently through the writings of Michael Ruse?

A. Sorry. You're going to have to help me.

Q. You're not familiar with that --

A. I'm familiar with Michael Ruse. I'm being completely honest. I don't know the test you're talking about.

Q. Are you familiar at all with any controversy amongst -- and apparently this is probably in the philosophy of science more so than necessarily in your area of expertise, but I'm not sure how much of a bleed over there is. I can imagine there's probably some.

A. Well, in advance of your explanation, I will say, yes, I'm sure there are probably some, but you would be astonished at how little attention experimental scientists pay to philosophers of science.

Q. I've heard that once before.

A. Probably as much attention as you guys pay to philosophers of law.

Page 208

Q. Now, in your last answer you equated methodological naturalism with a scientific method?

A. I did.

Q. Are the definitions one in the same or does scientific method denote something in addition to methodological naturalism?

A. The scientific method is -- it has been described in many ways, and most often it is described as proposing a hypothesis about nature, devising an experiment or an observation to test that hypothesis and then confirming or refuting the hypothesis on the basis of experiment or observation. That, in essence, is the scientific method.

The term methodological naturalism basically defines the terms of how the hypothesis is formulated and how the test is carried out, and the method is a method based in nature. So when we formulate a hypothesis, it deals with nature, it proposes a natural explanation for natural phenomena, when we test it via observation or experiment, we use natural methods to do the testing, and that's the way in which methodological

Page 209

naturalism ties in with the various steps of the scientific method.

Q. Now, these natural methods to do the testing may not necessarily be an experiment to prove or disprove the hypothesis; is that correct?

A. That is correct, and remember, as I said earlier, in general we don't prove things in science. We tend to prove things out. And a hypothesis that is remarkably resistant to disproof often becomes an accepted hypothesis. Never a proven one but often an accepted one.

Q. Would common descent be an example of a hypothesis that would be based on empirical observations as opposed to doing an experiment that would prove it or disprove it?

A. The idea of common descent is based both on observation and experiment. It's, for example, based on observations of the fossil record of anatomy and physiology, and to some extent it is also based on experimentation if you include, as I would, if you would include as experimentation the formulation of hypotheses about relationships between molecules, proteins and gene sequences which are then confirmed by experiments in which those

Page 210

similarities are investigated and studied and analyzed.

Q. Are there not natural phenomena in which we can account for presently in terms of materialistic explanations and an example would be the origins of life?

A. Are there natural phenomena that cannot be fully explained by materialistic observations? The answer is yes. You chose the origin of life. I would choose gravity, I would choose dark matter in the universe, and I would choose the way in which the vertebrate body is constructed during the development of an embryo because all of these are questions which cannot be completely answered by science, and to paraphrase an answer I gave earlier, on the day when we have complete natural explanations for all natural phenomena, people like me will be out of business because science will be finished. We will have explained everything.

Q. Yes, those are still scientific hypotheses?

A. Those are still scientific questions, correct.

Q. And just to clarify, there has not been,

Page 211

at least -- and I'll put it in terms of your satisfaction -- a successful materialistic explanation for the origin of life?

A. I would expand on that a little bit, if you'll allow me to, and the answer -- I'm sorry. The answer to that is yes. I regard the origin of life, as I think most scientists do, as an unsolved biological problem. Now, to say that the problem is unsolved is not to say that it's a problem about which we know nothing. In fact, we know a great deal, and we know, for example, that conditions similar to those that might have existed on the primitive earth allow the formation of -- the undirected formation of very, very simple building blocks of compounds such as proteins and nucleic acids.

We also know that small molecules produced from these compounds, such as small sequences of RNA, have catalytic properties, which means they can carry out chemical reactions, and some of them can even self-replicate and copy themselves. Therefore, there is the very strong inference which I draw and most sciences draw that there is no fundamental barrier that I or most other scientists see that

Page 212

would have prevented the origin of life on this planet by spontaneous means given conditions that prevailed on the primitive earth.

Q. Now, you used the term undirected again in your explanation. Was that --

A. No, the use of the term undirected was not an assertion. That was simply an observation that I don't see any particular reason to invoke an outside force to organize those first living systems. In the broader and more philosophical way of whether or not there is purpose and direction, I would argue that on that question science basically has to be agnostic. It has to admit it does not know and cannot know because considerations of meaning and purpose and direction are really outside of science.

Q. Now, you testified about your Catholic beliefs in terms -- very briefly in the terms of creationism and that discussion that we had previously, and my understanding is that you believe you hold to the orthodox Catholic view of divine creation; is that accurate?

A. I think that is accurate, yes.

Q. And do you also believe that God acted

Page 213

miraculously in salvation history, for example, the virgin birth? Is that something that you believe?

A. I accept the central teachings of my faith on issues such as immaculate conception, the birth of Jesus, the death and resurrection of the cross.

Q. The transubstantiation that occurs in the Eucharist?

A. Yes. Oh, absolutely. I believe in transubstantiation as a matter of faith.

Q. Is there anything that prevents God then from acting miraculously and discernibly in natural history as opposed to salvation history?

A. Well, let's analyze what you just said. Is there anything that prevents God from acting miraculously -- and what was the second word?

Q. And discernibly.

A. Indiscernibly in natural history.

Q. And.

A. Oh, and discernibly. That's not how I heard it the first time. Okay. There is nothing I would think as a person of faith that prevents God from acting in any way he chooses.

MR. WALCZAK: Or she.

Page 214

THE WITNESS: That's not my answer but that may be yours.

A. So if there is a supreme being and he is the author of the universe, then I see nothing that would prevent that supreme being from acting in any way that they chose. So the answer to that question is no.

Q. Does this then cause you to have to bracket you've got God acting miraculously and discernibly in something as simple as -- not as simple but as the transubstantiation of the Eucharist which occurs every day all around the world and whether or not God can act miraculously and discernibly in the physical world looking at your explanation of methodological naturalism?

A. Sure. Now, let's analyze your question very carefully. You talk first about transubstantiation. Transubstantiation is a belief that catholics but not all Christians hold that during the mass -- during the sacrifice of the mass the bread and wine are transformed into the body and blood of Jesus Christ.

An atheist friend of mind, a professor under whom I had studied, once volunteered to come

Page 215

to mass, take a sample of the wine after transubstantiation and prove to me that there were no red blood cells in it, no platelets, no white blood cells, that it was wine and not blood and surely he argued that would disprove the idea of transubstantiation, and I explained to him with a laugh that no Catholic would be convinced by that at all because what we believe, of course, is not that the gluten protein in the bread is transformed into the collagen protein that would be in the human body but rather the transformation is of a spiritual sort so that the bread and wine become spiritually the body and blood of Jesus Christ and that persons who believe in God by definition believe in a spiritual reality that transcends the material. So that is certainly my understanding, and I think the standard Catholic understanding of transubstantiation.

Now, you then ask a question that basically says what would prevent an all powerful, all knowing present God from acting in the world? The answer is in a theological sense, absolutely nothing, but what I look for as a sceptic and a scientist is evidence of such action, and what I see in the world around me is an orderly world and a

Page 216

world that follows what we come to regard as the principles and laws of science, chemistry and physics and then you brought into this some of the central miracles of Christian belief, including, for example, the virgin birth and the resurrection and so forth.

Those miracles are exceptional precisely because they are exceptional, and they have been testified to by the authors of scripture and by church tradition which many people may think reliable and many people may think unreliable, but I think most people in my faith regard as reliable in the sense that they testify to this miraculous events as a matter of faith.

Now, this doesn't cause a compartmentalization to anyone who does science, and I know a great many people of my faith who are very, very active in science and hold exactly the same view that I do, which is that these miracles that are mentioned in scripture are God's ways of communicating with us to point out the exceptional character of Jesus or to get specific messages across to his people, and the very fact that these are recognized as miracles points out their

Page 217

exceptionalism.

If you believe in an all powerful and all capable God, any event in history no matter how small or how large could in principle be attributed to God, and I think I mentioned earlier in the question that we speculate what God may have done in human history, personal history or natural history only at great peril. But again, what science has given us in the last four centuries is the investigation by natural means of the natural world. That investigation has been enormously productive in terms of helping us to understand how the world acts. Those investigations, I think, have not ruled out the existence of God but part of those investigations has been to show us that we have a biological origin in the process of evolution just like every other living organism on this planet.

Q. Do you believe it's possible to hold to ID and not be a Christian?

A. I suppose I should answer that question by saying yes because there is at least one person who is among the fellows of the Discovery Institute who has argued off and on for intelligent design and that is David Berlinski who professes not to be a

Page 218

Christian. I should also point out that there are a large number of writers in the Islamic world, including the Turkish writer who writes under the pen name of Harun, H-a-r-u-n, Yaha, Y-a-h-a, who have written articles critical of evolution and promoting intelligent design from an Islamic perspective.

So the direct answer to your question is yes, it is possible to advocate intelligent design and not be a Christian per se.

Q. You mentioned a Muslim. Do you believe it's possible to be an advocate of ID and not be a Muslim?

A. Well, since Michael Behe is an advocate of intelligent design and he is not a Muslim, I think that yes, it is possible.

Q. Well, isn't it true that ID does not adhere to any particular convention or dogma of -- I should put it this way: Doesn't adhere to any convention or dogma of a particular religion?

A. It is correct that intelligent design in and of itself is not sectarian in the sense that it is not the sole province of Muslims or Baptists or Methodists or Presbyterians, but I think it is also

Page 219

fair to state that the advocates of intelligent design throughout the United States overwhelmingly with exceptions so few as to be insignificant are motivated far more by religious beliefs and religious concerns about evolution than they are about any scientific evidence that might be produced in favor of intelligent design.

Q. I'm assuming you wouldn't disparage somebody as a scientist just because he's motivated by religion?

A. Quite frankly, I think as a scientist to some extent I am motivated by religion, and that is that I look around me and I see a world that exalts in life. I see all of that in one sense or another as the product of the work of the creator, and I enjoy playing a very small role in exploring life. So you might say I've got a theological motivation for that.

The critical distinction is not whether one's work is motivated by theological or philosophical considerations. I regard the critical distinction as whether one tries to pass off theological and philosophical doctrines as science, and that I would argue would be a terrible mistake.

Page 220

Q. I'm going to read to you again another paragraph on Professor Campbell's report, and then I'll show it to you. It's actually dropped as a footnote. He says, "For myself as a rhetorician and as a humanist educator, I cannot imagine anything more educationally salutary than a bold rhetorically-based plan for harnessing the abundant metaphysical energy of the American people for the study of science. Precise knowledge required to distinguish real from apparent design, the knowledge of biology required to discuss intelligently whether or not Darwinism stories were more plausible than intelligent design stories would unleash a tremendous and perhaps even distinctly American motivator to the study of science."

A. I wanted to see where the footnote was dropped from.

Q. Certainly.

A. Well, I will react to this in a number of ways, and you have already read the quotation, of course, and I confessed earlier that I always have some difficulty with what people mean by metaphysical, and you basically define metaphysical as dealing with God and the supernatural, and if

Page 221

that's right, I will assume that that's the definition I should read here. When this talks about "harnessing the abundant metaphysical energies of the American people for the study of science" -- and this goes on and says the precise knowledge to distinguish real from apparent design, the knowledge of biology required to discuss intelligently whether or not Darwinism stories were more plausible than intelligent design stories would unleash a tremendous motivator to the study of science.

I find the way in which this sentence regards Darwinism as a set of stories whose plausibility is to be compared to intelligent design stories to be naive at best and misleading at worst. Darwinism is not a set of stories. Darwinism is a set of testable scientific explanations which are repeatedly tested and have survived the experimental and observational testing for almost a century and a half.

The sentence goes on to say, "comparing them to intelligent design stories." Well, the interesting thing about intelligent design stories is there aren't any. Intelligent design stories amount to the designer did it, the designer did it,

Page 222

the designer did it. Because intelligent design or the stories that are mentioned here have no detailed system methods because they make no testable predictions, they are stories of an entirely different type than the Darwinian explanations, which are tested constantly by theory and by experiment.

What I would argue is that introducing into the educational system what this author calls the effort to distinguish real from apparent design would actually amount to an effort to completely confuse students of science as to how science works, what the scientific method is and how science rules in or rules out testable hypotheses. And the biggest problem is that intelligent design stories aren't stories, aren't testable and aren't science.

Q. And we discussed this a little bit previously and in his report Professor Campbell points to I think he counted 105 references to the design hypothesis in Darwin's work itself -- in Darwin's "Origin of Species." And I think I mentioned before and I think Professor Campbell describes it as the dialectical opposite design hypothesis to the hypothesis that was set forth in

Page 223

Darwin's theory.

Is that not to compare the two whether you even refute -- you use it to refute intelligent design like you've been doing in the writings and the debates and so forth, do you not see that as an educational goal, one that would motivate students to learn perhaps Darwin's theory even better?

A. I think the critical analysis is always a good idea, but I also think when we, for example, teach medicine or we teach health, we don't hold up witchcraft and evil spirits as alternative hypotheses with equal scientific stature to modern scientific method or the modern principles of health, and there is a reason for that, and the reason for that is in the current state of science we have gone beyond that. We have ruled these ideas out.

Now, Darwin wrote in 1859, and to conduct education as though the scientific questions that are out there today are identical to the questions that existed 146 years ago is terribly misleading and would not serve education well. The other thing that bothers me about this idea is that it involves essentially taking an idea that has achieved no

Page 224

standing at all in the scientific community, has produced no testable hypothesis and has been rejected by mainstream science for decades and would place it in the classroom as the coequal of a theory that has indeed stood the test of time, observation and experiment, and I think we owe our young people better in terms of presenting them with a more realistic view not just of science but of the scientific method.

Q. Now, the stated that there's no testable hypotheses. Have you not tested the hypothesis of irreducible complexity based on scientific evidence?

A. The claim of irreducible complexity is not the same as the hypothesis of intelligent design because remember -- and I tried very hard to make this distinction clear, and perhaps in my early answers I didn't make it clear enough. The concept of irreducible complexity is the notion that there exists within the living system complex machines that are made up of multiple whereas the removal of any single part prevents it from functioning properly. Therefore, such systems would have had to have been assembled all at once, and that's the

Page 225

hypothesis of irreducible complexity.

The way that I have refuted that is simply by pointing to the scientific literature which shows there are indeed subsets of various parts that do have a function, and therefore, the whole idea of irreducible complexity falls apart. Now, the important thing to understand is that intelligent design is not the same as irreducible complexity.

Irreducible complexity is simply an analytical argument for why a particular structure could not have been produced by evolution. By breaking down that argument, I've effectively opened the door and said yes, this thing could have been produced by evolution.

Now, what does any of this have to do with intelligent design, which, as I said, was not testable. The argument which Professor Behe and Professor Minnich and others argue is that irreducible complexity shows that there is no evolutionary pathway to a structure. I've shown that I think that argument is wrong. They then say if there is no evolutionary pathway, what else could have produced it? Since no one to their reading is stepping forward, they say okay, maybe it was

Page 226

designed.
That hypothesis that the bacterial flagellum or the Red Sox comeback after being down three games to none to the New York Yankees last year was the product of intelligent design or of divine intervention is not a testable hypothesis in either case, and that's why intelligent design itself is not testable. Many of the arguments used to support intelligent design are testable and can be testable, but the idea of intelligent design itself is fundamentally untestable, and that's why it's not science.
Q. You're saying then, for example, if you -- let me strike that. If there is no evolutionary pathway that would lead to the bacterial flagellum, for example, is it not a reasonable inference to say that you cannot rule out design, and I have a couple of negatives in there?
A. You do, and I'll forgive you the negatives. I'll be very upfront about this. One can never rule out causality of a supernatural nature that extends outside of nature for any event of any sort in human history, political history or natural history. So when you ask can we rule out

Page 227

design, the answer is no. But remember the reason you cannot rule it out is because design is not a scientific idea. It's a supernatural hypothesis.
To be a scientific idea, it has to be testable. You have to be able to rule it out, and when you make the point that you cannot rule out design as the origin of flagellum, I would say yes. You also cannot rule out supernatural divine intervention as the reason for the fall of the Roman Empire, the founding of the American Republic, the assassination of Abraham Lincoln or the Red Sox victory in the world series.
All of those are possible because if there is a God, he set up the rules, and he can do anything he wants, but testing any of those ideas in terms of divine causality or intelligent design is beyond the boundaries of science, and that's the point.
Q. Well, can't you prove that by showing that there is an evolutionary pathway that it wasn't created by intelligent design?
A. No, what's showing there that as an evolutionary pathway shows is that there's an evolutionary pathway. That's all. The arguments of

Page 228

intelligent design advocates basically are that there are no such evolutionary pathways and then some other process must have produced, but that's entirely negative evidence. In other words, they are advocating supernatural progressive creation as the default explanation for anything that cannot currently be explained by science, and I'll give you an example because I think this is an important point to make.
If we were having a discussion in 1880 and we were talking about what is the force that powers the sun, where does sunlight, heat, warmth and so forth from the sun come from? We can take the science of the time and we could rule out the notion that the sun was a big ball of flame made up of burning oil or burning wood or burning wax or any known chemical reaction in 1880, and we could do that because we could calculate the amount of energy that the sun puts out, we could calculate over many years the fact that the sun's diameter if it's decreasing, it's decreasing only very slightly, and if the sun was made of any fuel that powered a known chemical reaction, its diameter should be increasing much more quickly. Therefore, in 1880 could we rule

Page 229

out the possibility that the sun's actions were due to some sort of divine intervention, the answer is absolutely no, we could not rule that out.
As you know, 25 years later there was a scientific explanation put forward for the power of the sun, and that turns out to be thermonuclear fusion, a force unsuspected by nature. So if at the time in 1880 science had simply thrown up its hands and said the explanation lies outside of nature, science would have stopped and we never would have done the investigatory work that was necessary to understand where the sun's power actually came from.
That's the danger of attributing natural phenomena to supernatural causes or for that matter, to design, which is essentially a call to say let's stop seeking natural explanations.
Q. It's your claim that science would stop if we refer to those supernatural explanations? Do you think it would stop someone such as Richard Dawkins from trying to disprove that hypothesis?
A. I don't think anything would ever stop Richard Dawkins. He is a force of nature. But if it became the generally accepted idea in the scientific community that an intelligent designer

Page 230

acting outside the forces of nature were responsible for the essential features of living organisms, then people who actually believed that, people who were educated that way, people who were held to that view would indeed stop seeking to find those natural causes because in many respects they would regard any effort to find a natural cause for the bacterial flagellum, the eukaryotic cilium, the blood clotted cascade, they would regard any effort to find a natural cause for those as somehow undermining their faith in its intelligent designer.

My greatest concern about science in the United States is that the intelligent design movement will succeed in placing a faith-based wedge between young people who are religious and the theory, practice and interpretation of science. That the intelligent design movement will succeed in convincing young people that science is somehow antifaith, and therefore, is something neither to be believed nor to participate in.

Q. Now, you would have to agree there is certainly a sect of the American population -- and perhaps your counsel could probably point to them more clearly than I could -- that would desperately

Page 231

try to refute any of those claims using science?

A. Yes, I believe that's true. Depending -- my own reading of public opinion polls is that depending upon how you ask the question -- wording is important. Depending upon how you ask the question, about 45 to 50 percent of the American pubic says that they reject Darwin's theory of evolution. I think also about 25 percent of the American public thinks that we never went to the moon, a large proportion thinks that we found weapons of mass destruction in Iraq and a large portion reads astrology columns widely printed in newspapers every day.

Q. So you don't see any sort of religious motivations at all fueling students to inquire further into the scientific areas?

A. Help me out with what you mean by these religious motivations.

Q. Well, you basically claim that science would stop -- I believe those are the words you used -- if there's a reference to a supernatural explanation, as you believe intelligent design advocates. Did I state that correctly?

A. I don't think so. I think what I said is

Page 232

that if a majority of young people became convinced of the validity of intelligent design, what it might succeed in doing is driving a faith-based wedge between them and the theory and practice and interpretation of science and that that would be disastrous for this country.

Q. Has it not been your experience that students find a faith-based wedge being placed between them and science based on the theory of evolution, and I would point to you again the comment or statement by Richard Dawkins?

A. Well, I don't think so, and the reason I don't think so is because if you look at the curricula material, for example, that's being provided to students in Dover, Pennsylvania, you won't find that quotation from Dawkins and you won't find that quotation from Simpson and you won't find that statement from Stephen Jay Gould. What you will find -- and I would invite you to read through our textbook carefully -- I would invite you to read through the Pennsylvania science curriculum is instead the absolute and I think very careful explanation that science in general and evolution in particular deals with the biological origins of

Page 233

various species on this planet, including ours, and says nothing about meaning, purpose, direction and so forth.

You, for example, without telling me the copyright date of it, held up a photocopy of the chapter in an edition of our textbook that was actually written about 12 years ago.

Q. And during a break I believe if you would, I said the 1995 edition.

MR. WALCZAK: You did. I heard that, yes.

A. Then I apologize because I certainly didn't hear you. But that particular -- you highlighted a statement in there, and I immediately said I object to that, I think it's philosophical in nature and, in fact, such statements have indeed been removed from our book. So the wedge that you're speaking of I don't think is being driven by our textbook. I don't think it's being driven by the Pennsylvania State curriculum and I doubt very much it's being driven by teachers in Dover, Pennsylvania. The wedge I would argue is being driven by people behind the intelligent design movement and various religious leaders around the country and probably some in Dover who are arguing

Page 258

nonetheless prevails even in microorganisms, although horizontal gene transfer makes it extremely difficult to trace.

If one were to back up just a little bit and say, well, let's just talk about animals, and let's talk about multicellular complex animals. Do they show common ancestry? The consensus that they do is absolutely overwhelming, and that consensus has been strengthened in the last 20 years by studies in molecular and developmental biology that show that all complicated multicellular animals share what you might call a common tool kit of genes that helps to build the multicellular body that is characteristic of animals.

Q. Do ID advocates refute that proposition, common descent?

A. Some do.

Q. And based on that answer, some don't?

A. The only -- and I mean the only intelligent design advocate I have ever heard say that he has no problem with common descent is Michael Behe. As I mentioned earlier, William Dembski as written recently about separate descent of humans and our great ape relatives, and one of

Page 259

the principle contentions of the intelligent design movement, which is that the organisms that appeared in the Cambrian period were designed, that argument in and of itself argues for separate descent as opposed to common descent. Because if all of these different types of organisms were indeed each designed, then they also show different descent as opposed to common descent.

Q. Now, are you familiar with some of writings or works of Carl Woese and Ford Doolittle with regard to the question of common descent?

A. Yes, I am.

Q. And my understanding is that they had a view that the origins of life was not -- it wasn't from a single origin but from multiple origins. Is that correct?

A. Yes, that is. It might be true for Woese, I'm not sure about Doolittle, but both Woese and Doolittle have confined their scientific work to the study of genomes of microorganisms, the organisms that we call prokaryotes, and these are precisely the organisms in which horizontal gene transfer is an issue.

Now, I don't know specifically what they

Page 260

said about multiple organs, and they may very well have written that the process of horizontal gene transfer makes it impossible to rule multiple origins out.

Q. Would their study in their work, I guess, create a scientific challenge to common descent?

A. No, because as I mentioned in my previous answer, common descent is broadly held by the scientific community with -- and I mentioned it before -- the complication of horizontal gene transfer, which is precisely the issue that Woese and Doolittle have addressed.

Q. In your 2004 edition of Biology, do you mention the horizontal gene transfer in relation to common descent?

A. To be perfectly honest, I can't remember if we do or if we don't. I do know that my coauthor, Joe Levine, when he speaks to students and teachers about this shows slides indicating horizontal gene transfer. It is something that if it is not in the 2004 edition, we definitely plan to include in the next edition.

Q. Would it be presented in the sense that it causes a challenge at all to the notion of common

Page 261

descent?

A. Since it doesn't actually cause a challenge, we certainly will not present it that way. What horizontal gene transfer does is it makes it difficult to trace common descent through microorganisms, and that's a very important point. As I mentioned, once one gets to more complicated organisms -- and I specifically mentioned the animals, but this would also apply to the plant kingdom -- once one gets to more complicated organisms, there is no serious challenge to the notion of common descent in terms of following the experimental evidence.

Q. But if Woese, for example, concludes that there is multiple origins of life, that doesn't cause a challenge to your common descent?

A. Can you show me papers, quotations, references, so I can comment on that paraphrasing context?

Q. I don't have that with me at this time, unfortunately. The work from Woese that you were referring to, again, with the horizontal gene transfer, in that work did he mention at all about multiple origins or again, you're not certain if --

Page 262

A. I'm not certain about it, that's right.
Q. And I'm going to have to ask a hypothetical because unfortunately, I don't believe I have that particular study here with me. If he concludes that his evidence shows that there are multiple origins of life, would that cause a challenge to the proposition of common descent?
A. Again, you ask a hypothetical.
Q. Yes.
A. I'm not sure that Woese has ever concluded that. I think what he may have written is that the phenomenon of horizontal gene transfer makes it impossible to determine if there was a single origin for life or if there were multiple origins. Now, that's not the same thing as concluding that life originated multiple times.
Would it cause a problem for the notion of common descent? The answer is, to be perfectly honest, no, because as I said, we belong to a group of organisms -- well, let's see. I'm going to use a technical term. We belong to a group of multicellular organisms known as the Deuterostomata, d-e-u-t-e-r-o-s-t-o-m-a-t-a, and all of the animals that we see on the land and most swimming animals

Page 263

and so forth, the animals that we're concerned about in the living kingdom all belong to that category, and there is absolutely no question that all animals in that category share a common origin.
Q. And we spoke briefly about the Cambrian explosion. I want to revisit that. Are there multicellular precursors to the Cambrian fauna?
A. Yes.
Q. Such as? Can you give me an example?
A. Yes, there is a large and very well-developed fauna in the Vendian period, v-e-n-d-i-a-n, that predates the Cambrian by between 100 and 150 million years, and these are found in fossil formations in Australia and I believe on some other continents, and they include large multicellular animals and plants.
Q. These -- and I'm not sure if I'm pronouncing it right -- the ediacara fauna?
A. That is correct. You are pronouncing it right. In addition, in recent years a large number of multicellular animal embryos that look like they belong to that same category of animals that we belong to have been discovered in Precambrian rocks. And about a year and a half or two years ago, there

Page 264

was a stunning report in science of microscopic bilateran, b-i-l-a-t-e-r-a-n, animals fossilized in Precambrian rocks.
So there are many examples of multicellular organisms and even animals that are bilateral, that showed two-sided symmetry, just as we do, in Precambrian fossils.
Q. With regard to the ediacara fauna, have not Steven Jay Gould and Simon Conway Morris written about their doubts of that fauna actually being Precambrian fauna?
A. I'm unaware of any doubts that either Gould or Conway Morris have had about those being Precambrian. I think that's clear that they are. The doubts that they might have expressed is to whether or not the ediacara fauna are ancestral to the Cambrian animals, and it's quite likely that they are not ancestral to the Cambrian animals.
Q. If they're not ancestral, does that not break the line of common descent?
A. It doesn't break the line of common descent in that, as we often say in science, the absence of evidence is not evidence of absence, and the fact that you haven't discovered an organism yet

Page 265

doesn't mean it could not have existed.
The most striking thing about the animals that appear in the Cambrian is that many of them left modern descendents. We can see, for example, in the Cambrian the ancestors of the chordates, which are the group of animals to which we belong, ancestors to the arthropods, the animals to which insects and crustaceans belong, ancestors of worms.
When we analyze the genomes of all of these organisms today, which has only been possible in the last decade, the astonishing discovery is that they all share a common molecular tool kit built into their genes which builds the body. So what this suggests on the basis of this experimental evidence is that what really happened in the years preceding the Cambrian was the development of a common toolkit for the construction of the animal body, and that common toolkit made possible through rapid diversification of different body plans that we see in the Cambrian.
So far from presenting a challenge to evolution, the Cambrian explosion in the view of most scientists represents an astonishing opportunity for evolution and developmental biology

Page 266

to get together to explain exactly what happened.
Q. That Precambrian fauna, was it not extinct prior to the Cambrian period?
A. That is -- well, once again, absence of evidence is not evidence of absence, but most of the animals that show up in the ediacara fauna vanish a few million years before the Cambrian, but remember the two other discoveries that I mentioned, which is now from fossil sites in China which are continuing to yield great finds in the years immediately proceeding the Precambrian. We do find multicellular embryos that could very well have been the ancestors of some of the animals in the Cambrian, and the most recent fossil discovery, which has been published in science but still needs verification, is the discovery of small, bilateral, sort of worm-like animals that clearly could have been ancestral to several of the Cambrian forms.
Q. If you consider an octopus -- for example, let me give you an octopus, a starfish, an insect and a fish, what phyla do these belong? And I'll read those to you again, an octopus, a starfish, an insect and a fish.
A. Can you tell me what kind of fish? I

Page 267

don't mean to be specific. Is it a bony fish or cartilaginous fish? Is it a shark or a minnow?
Q. We'll pick a minnow.
A. Okay, cool. Well, you're testing my knowledge of biological classification. The octopus belongs to the phylum mollusca, m-o-l-l-u-s-c-a; the starfish belongs to the phylum Echinodermata, e-c-h-i-n-o-d-e-r-m-a-t-a; the insect belongs to the phylum Arthropoda, a-r-t-h-r-o-p-o-d-a; and the fish belongs to the phylum Chordata, c-h-o-r-d-a-t-a. You asked.
Q. That was beautiful. Is there fossil evidence that show that they each share a common ancestor?
A. The question you asked is is there fossil evidence that shows that these share a common ancestor? The answer to that is no, we don't have evidence yet of a common ancestor for these four different phylum. We do, however, have molecular evidence from organisms living today, as I mentioned several times, that all of these organisms share a common molecular toolkit, which is strong evidence on a molecular evidence, and many people would argue that molecular evidence is more important than

Page 268

fossil evidence, that they do share a common ancestor in molecular terms.
Q. I want to return to the bacterial flagellum, if we could.
A. What a surprise.
MR. WALCZAK: This case could be known as the bacterial flagellum case of intelligent design.
BY MR. MUISE:
Q. Well, I have learned a little bit about the -- and I'll just refer to it as the TTSS?
A. The type III secretory system, TTSS, agreed.
Q. And I believe you testified previously that it's simpler than the flagellum in that it is composed of less protein?
A. Yes, the type III secretory system is composed of ten proteins, all of which are strongly homologous to ten proteins which are found in the base of the typical bacterial flagellum. It's very important to appreciate that there are many different kinds of bacteria, and there is no one the bacterial flagella. There are many types of bacterial flagella. They share common similarities

Page 269

but they do differ from each other in some respects.
Q. And my understanding of the, I guess, atypical bacterial flagellum is composed of approximately 40 protein?
A. I think that's about right. If I remember from a review article from David Derosier at Brandies University that there are about 40 proteins in the flagellum, but there also are about ten other proteins which are not part of the flagellum but are required for the assembly of the proteins into the flagellum. So you really need about 50 protein products or about 50 genes to make the bacterial flagellum.
Q. Is it your point that the TTSS is a precursor to the bacterial flagellum?
A. No, it is not. Do you want to know what my point is?
Q. Sure.
A. Okay. My point is that if the claim is made, as we've discussed many times today, that the bacterial flagellum is irreducibly complex, then by Behe's own definition any precursor to it that is missing a part should be in his words by definition nonfunctional. The TTSS is missing 40 of those 50

Page 270

components and it is perfectly functional. Therefore, the existence -- the very existence of the TTSS shows by the terms of the intelligent design people themselves that the flagellum is not irreducibly complex.

Q. In that explanation do you have to assume that the TTSS is a precursor to the flagellum?

A. No, you do not. I should point out, however, that in the last three years two scientific papers have appeared based on direct work on the bacterial flagellum that have argued that the TTSS is indeed ancestral to the flagellum or at least evolved in parallel. One was written by a scientist named Aizawa, A-i-z-a-w-a, and I believe it was published in 2001, and there is a more recent paper published in 2003. I don't recall the name of the author, but I have it on my desk upstairs -- and it would be very easy to get it -- in which by a genetic analysis of the proteins at the base of the flagellum and the proteins in the TTSS, he argued that the TTSS and the flagellum share a common ancestor. In other words, that there was a TTSS-like system which actually was the ancestor of the bacterial flagellum.

Page 271

Now, it's fair to say that currently for lack of good data opinion in the scientific community is divided as to whether the flagellum was the ancestor of the TTSS or something like the TTSS was the ancestor of the flagellum. What is beyond dispute is that the TTSS forms a component part of the bacterial flagellum that is functional in its own right; and therefore, the bacterial flagellum is not irreducibly complex.

Q. Is one of the works -- and I reference to Milton Saier, S-a-i-e-r. Are you familiar with him?

A. It sounds familiar, but I can't quite place it.

Q. It's my understanding that his work suggest that the TTSS evolved from the flagellum rather than into it?

A. It may well suggest that, and remember that I just said it's my understanding that opinion in the research community is divided. So the two papers I referred to would suggest TTSS as being ancestral, and apparently the paper that you're citing would suggest the flagellum as being ancestral, and that's the mark of divided opinion.

Q. I take it from a prior answer that you had given on another question that it's not necessary the challenge of evolution to explain how you get complex systems from simpler ones. I think you explained that simpler ones may derive from complex ones and that's consistent with evolution. Did I say that correctly?

Page 272

A. No, I don't think you did. I think my prior ancestors deal with whether or not in analyzing the arguments that are advanced for intelligent design, it's necessary, specifically irreducible complexity argument, whether it's necessary to provide a step-by-step Darwinian pathway for the evolution of structure, and since irreducible complexity makes other claims that are testable, I think the claim of irreducible complexity can be refuted and is refuted without providing that step-by-step Darwinian pathway for evolution.

What you just asked me, however, is whether or not it's necessary for evolution to do that? I think one of the goals of research in biology in general and evolutionary biology in particular is indeed to understand the evolution of complex structures, and just to volunteer an example, in recent years the explosion of information on comparative genome sequences of vertebrates has made it possible for the first time to test a number of hypotheses about the evolution of the blood clotting system and the evolution of the immune system, and evolutionary biologists are working very hard to understand the detailed Darwinian step-by-step evolution of these systems. So, yes, I think that is something that evolutionary biology tries to do.

Page 273

Q. Well, is it a challenge to evolutionary biology to -- a challenge to the basic propositions of evolutionary biology to go from a complex to a simple?

A. No, I don't think that's a challenge at all. I think one can easily understand how a complex system might shed some of its part to achieve function as a simpler system with fewer parts. Now, if irreducible complexity was right, that would be impossible because lose a part by definition you become nonfunctional. But in evolutionary terms, it's I think quite easy to see how a complex system could shed a few of its parts and have another function as a simpler system.

Page 274

Q. Are you familiar with the work of James Shapiro, who is apparently on the faculty at the University of Chicago, and Franklin Herald, who apparently is an emeritus status at Colorado State University, one is a molecular biologist and Herald a cell biologist. Are you familiar with those two?
A. As a graduate student, I worked in the laboratory briefly of Frank Herald, and he was not at Colorado State and would probably take offense. He was at the University of Colorado Medical Center and the National Jewish Hospital. I believe Shapiro is also professor emeritus. He's retired, but I'm familiar with Frank Herald's work and I know him as a mentor and a friend. Shapiro I've read bits and pieces of his articles.
Q. I'll ask you is it accurate that they claim that there's no detailed accounts for the evolution of systems like the flagellum?
A. It is accurate that -- let's take Herald. It is accurate that Frank Herald has pointed that out in print, and I have also corresponded with Frank Herald, and he has read parts of my book and has basically said, gee, I was unaware of the accounts in the literature that I cited in my book,

Page 275

"Finding Darwin's God," of the evolution of the CREB cycle and of the evolution of certain electron transport pathways; and therefore, basically Dr. Herald has told me that he was unaware of these accounts even though he wrote otherwise in print.
Shapiro, as you point out, has indeed written that, but these statements basically appeared before a number of scientists, myself included, did point out the existence of detailed accounts of the evolution of complex biological systems.
Q. Which are the complex biological systems that you're referring to?
A. Well, the specific one that I pointed out in my book was the evolutionary CREB cycle. I would go further and also say that Russell Doolittle -- Russell Doolittle's work on the evolution of the blood clotting system is also a perfectly good example of the evolution of a complex biochemical system by molecular means. Dr. Behe, of course, in his book, "Darwin's Black Box" wrote otherwise, but I think he was mistaken.
Q. The Doolittle experiment -- and I'm not sure if it's the same individual -- or Doolittle

Page 276

paper, is that the one referenced to the mice and their blood clotting system?
A. No, it was not. The reference to the mice and the blood clotting system were experiments that I believe were done in the laboratory of Dr. Joan Brugge, B-r-u-g-g-e, and not Doolittle.
Q. Well, following on this line of these complex systems, are you aware of any experimental papers or research that's shown natural selection has produced the ribosome?
A. No, the ribosome is the basic protein synthetic apparatus that as far as we know has been inside every cell that has ever existed on this planet, and therefore, probably has a history that's almost three billion years old. So the answer is no, we do not have a detailed evolutionary explanation for the ribosome.
I'll note one thing, however, and that is the current work on the function of the ribosome has shown very clearly that the catalytic activity of the ribosome -- the ribosome's main job is to catalyze the formation of peptide bonds. The catalytic activity of the ribosome is concentrated in a very small portion of the RNA molecule, which

Page 277

is in the middle of the ribosome. So that even though the ribosome is composed of dozens of proteins -- almost 100 in the case of a eukaryotic ribosome -- the important portion, the functional portion of the ribosome actually resides in a very short stretch of RNA, thereby providing a plausible way to understand how the ribosome evolved.
Q. Same question regarding the natural selection producing the proteosome?
A. I'm unaware of any evolutionary analysis of the evolution of the proteosome, but I'd also point out regarding the absence of an evolutionary explanation that the proteosome was only discovered about 15 years ago, and we are still in the process of figuring out exactly how the proteosome works, and one can hardly put together an explanation of the origin of a biochemical machine until one has a complete understanding of its function, and we don't have that understanding for the proteosome yet.
Q. Same question with regard to the cilium?
A. The cilium I think is a more interesting case, and the reason for that is -- there are three principal components, proteins found in the eukaryotic cilium, and those are the protein known

Page 278

as tubulin – it's actually two proteins but we regard it as one – a protein known as dynein, and a linking protein, which is sometimes called nexin.

All three of these proteins have other functions in the cell which are distinct from their combined function in the cilium; and therefore, the principal claim that Michael Behe has made that the cilium is irreducibly complex is actually easily falsified because there are functional parts. Tubulin does one thing in a cell. Dynein is responsible for the movement of vesicles throughout the cell. Nexins are linking proteins which are related to other proteins in the cytoskeleton.

So I'm not aware of the detailed step-by-step analysis of the evolution of the eukaryotic cilium, but I also don't think it represents a problem in terms of the argument from irreducible complexity.

Q. Did we mark the testimony?

A. Yes, we did.

(Defendant's Exhibit No. 11 was marked.)

BY MR. MUISE:

Q. Could you take a look at Exhibit 11. If you want to thumb through that, I'll represent to you that I received that from plaintiff's attorney, and it's supposed to have included all of your testimony given in Georgia regarding the Cobb County case.

A. Is there a question?

Q. Does that appear to be your testimony?

A. Yes, it does.

Q. Have you had a chance to review your testimony in written form?

A. I haven't read it in detail, but counsel for the plaintiff did provide me with this a couple of nights ago, and I skimmed through it briefly, and I assume it to be accurate.

Q. Was there anything that you recall reading through there that struck you as perhaps you misstated an answer to one of the questions?

A. I suppose it's possible, but as I skimmed through it, there's nothing that caught my eye.

Q. And who asked you to testify in that case?

A. Say it again, please.

Q. Who was it that asked you to testify in that case?

A. Let me think about this for a moment. Oh, I was asked – I visited Atlanta in April 2004, and I gave a talk at Georgia State University, and when I was there, the lead plaintiff in the case, a person named Jeffrey Selman identified himself to me at the seminar, mentioned the fact that his lawsuit was possibly coming to trial and asked me if I would be willing to come to Atlanta and testify and I said yes.

Q. Now, my understanding is you testified as a fact witness and not an expert witness; is that –

A. That's my understanding, too.

Q. And you did not give a deposition in that case?

A. I did not give a deposition.

Q. Do you know why you were testifying as a fact witness and not an expert witness in that case?

A. Not exactly.

Q. If you look on page 143, there was a question asked beginning on line 16, "When you were writing your material on evolution, did you add information about the scientific evidence against evolution?" And you said, "The short answer to that is no."

Was the book that was at issue in Georgia, is that -- was that the 2004 version of the dragonfly book?

A. No, it was the 2002 version. I will for your benefit stipulate that most of what is included in the 2002 version with respect to evolution is quite similar to the 2004 version. There are about four chapters in the 2004 version that we completely rewrote, but those chapters were on molecular biology and on physiology. They were not on evolution.

Q. Does your answer to this question -- let me just ask you with regard to 2004 a similar question. Did you add information about the scientific evidence against evolution in your 2004 version of the book?

A. In some respects the answer to that is yes, and here's how I'll explain it: I will refer to my testimony on page 145, line 11, and I'll just read that into the record, and this is a statement I certainly stand by. "With respect to evolution and biology, is there evidence, good scientific, solid evidence, that directly contradicts the theory?" And, of course, I meant the theory of evolution. "I would say, no, I haven't found any, and most scientists would give the same answer."

Page 282

That statement that I am unaware of any evidence against evolution, which is to say that contradicts evolution, that is still the answer I would give today. I'm unaware of any piece of evidence that contradicts the theory of evolution. Now, having said that, one of the things that we specifically did in the 2004 edition was to include a heading, and I can find the exact page -- but, of course, you have a copy of the book here, so we can refer to it -- was to include a heading called strengths and weaknesses of evolutionary theory, and under that heading we did our best to point out some of the unexplained problems that confront evolutionary theory, and some areas in which there is no evolutionary explanation. That is the difference between the Cobb County book and the book that is at issue in Dover, Pennsylvania.

Q. I want to follow up with that, but before we do, since you're looking at your testimony, that same page on page 145 starting at line 22, you state, "In the evolution section of our textbook, we point out that scientists, for example, disagree about the relative importance of natural selection," and then you list some other factors.

Page 283

Is that statement accurate there that scientists do disagree about the relative importance of natural selection?

A. Not the way you just quoted it. I'll read it again. They disagree about the relative importance of natural selection, sexual selection, chance, species hybridization and a whole host of other factors, all of which influence evolution." The answer is, yes, I stand by that, and it's very similar to an answer that I gave earlier with respect to my expert testimony in which I indicated that there's no disagreement about whether the mechanism of evolution can be explained by factors observable in the world today, but a number of factors that influence evolution, there is some disagreement about, and that's also what the testimony here says.

Q. If you would continue on to page 156 of your testimony and particularly line 16 through 23, would that be I guess similar in conscience with the answer that you just gave about disagreements over certain aspects of evolutionary theory?

A. Yes, I think it would be, and what you see on page 156 of the testimony is an answer that is

Page 284

identical to an answer I gave you earlier on the two meanings of evolution. Lines 4 through 15 on that page, for example, refer to evolution in the sense of what happened in the past, and lines 16 through 23 refer to a different meaning of evolution as the explanation for how those changes took place.

Q. In looking at this testimony, the lines you just pointed to, on lines five and six with regard to the first definition of evolution that changes occurred over time, you state "the scientific community really is of one mind that evolution took place, that we are descended with modifications from earlier organisms and so is everything else on this planet."

That aspect of evolution as you state, "the scientific community is of one mind," there's virtually no disagreement over that, correct?

A. I believe that that statement fairly presents the overwhelming scientific consensus, yes.

Q. And then beginning on line 16, you contrast that with how evolution took place, correct?

A. I do contrast it with how evolution took

Page 285

place because I say that's a different meaning of the word evolution.

Q. And how evolution took place, there is considerable disagreement, and you list some of the components of that that are -- that there is scientific disagreement over; is that accurate?

A. It is accurate, and these are the same sorts of components that were listed in my expert statement and elicited by you in an earlier question today.

(Defendant's Exhibit No. 12 was marked.)

BY MR. MUISE:

Q. So you have in front of you what's been marked as Exhibit 12, and you're referencing in your prior testimony the inclusion of a new section -- I guess it's for the first time appeared in the 2004 version of your biology book entitled, "Strength and Weaknesses of the Evolutionary Theory." Is that correct?

A. That is correct.

Q. And that section has not appeared in prior versions of your biology text?

A. That is also correct.

Q. What was the purpose for putting that in

Page 286

the 2004 version?
A. The purpose for putting that in the 2004 version was that the state requirements of the State of Texas specifically required students to analyze and critique the strength of scientific theories and hypotheses. Now, that standard, which is known as TEKS 3A in Texas applied to scientific theories in general, but as we submitted our textbook to the State of Texas, it was clear that there was only one scientific theory or hypothesis that any member of the state board of education was interested in seeing strengths and weaknesses for, and that one theory was the theory of evolution.
So we tried to make it very clear that we were able to discuss and present the strengths and weaknesses of the theory of evolution by placing a heading and by talking about what we regarded as strengths and weaknesses of that scientific theory and hypothesis.
Q. Do you have any further explanation than these short two paragraphs that are listed under that heading?
A. Yes.
Q. Can you identify where those sections are

Page 287

in the book?
A. I'd be happy to if you'd hand me the book.
Q. I certainly will. I don't want to make this an exhibit to the record, but if we can just acknowledge --
MR. WALCZAK: I'm sure Ken would be happy to sell you another copy.
BY MR. MUISE:
Q. Referring to the 2004 version of his biology textbook -- what I'd like to do -- why don't we take it under the -- it appears you have three separate categories where there are questions under the strengths and weaknesses. The first one is "Precisely how new species arise."
A. Well, excuse me, you asked me a previous question relating to my book, and now you're asking me a different question. So let me answer the first one first. You said where else in your book do you deal with strengths and weaknesses, and that's what I was about to answer by delving into the book.
Q. And let's just clarify. Strengths and weaknesses with regard to Darwin's theory or the strengths and weaknesses with regard to any theory?

Page 288

A. Well, with regard to any theory. I was about to read a passage from chapter 1, page 15 on the status of scientific theories, including evolution. I take it you're not interested in that?
Q. Well, obviously since this case is about evolution, I want to focus on -- and that's where I want to direct your specific attention. Let's go back to Exhibit 12, and maybe we can organize this question a little bit more clearly.
MR. WALCZAK: Wait, but if your question is if there is any criticisms of evolution and to the extent there's criticism about all theories that would encompass evolution.
MR. MUISE: Indeed.
MR. WALCZAK: It's unfair to just focus on evolution if you've got a criticism that's broader than that.
MR. MUISE: Well, that may be fine for what you believe, but I want to get to what my question was, and we were looking at Exhibit 12, those two paragraphs, and I was asking if he has any information beyond

Page 289

what's in those two paragraphs and as related to evolution.
BY MR. MUISE:
Q. Is this the extent of what you describe as the strengths and weaknesses of evolution in these two paragraphs?
A. No.
Q. Thank you. Now, to try to organize the following response, I wanted to look at -- there appears to be three areas that you identified in the subcategory where you say that there are questions, and I want to go to those three areas, and see if we can identify sections that address those three areas. Are you following me or --
A. I am.
Q. Okay. And then the first one that you have is "Researchers still debate such important questions as precisely how new species arise." That appears to be the first one.
A. Okay.
Q. Do you have specific sections that you can just refer us to, and I prefer just to refer to the section. We don't have to read anything.
A. Sure, but I've got to find them first.

Page 290

Okay. The first one was the notion of change over time.
Q. The first one was how new species arise.
A. Oh, okay, how new species arise. In chapter 16 on page 410, we have a heading on "Studying Evolution Since Darwin," and we have two what we call sea level headings, which are headings in the text, one called "Limitations of Research," and one called "Unanswered Questions." I'll read from Limitations of Research. "The Grants' research clearly shows the effects of directional selection in nature. The Grants' data also show how competition and climate change affect natural selection. The work does have limitations. For example, while the Grants observe changes in the size of the finches' beaks, they did not observe the formation of a new species."
I will skip a little bit farther down. "Evolution" -- oh, sorry. Same page, "Remember that a scientific theory is defined as a well-tested explanation that accounts for a broad range of observations. Evolutionary theory fits this definition. To be sure, many new discoveries have led to new hypotheses that refine and expand

Page 291

Darwin's original ideas. No scientist suggests, however, that all evolutionary processes are fully understood. Many unanswered questions remain."
So that passage refers specifically to the issue of speciation. Now, which is the next issue that you wanted me to address?
Q. Why species become extinct.
A. Now, I'm going to read a few lines from page 435 relating to extinction, and the passage indicates the use of hypothesis and the uncertainty with respect to extinction. "During these events, some biologists propose many species became extinct because their environment was collapsing around them rather than because they were unable to compete. Under these environmental pressures, extinction is not necessarily related to ordinary natural selection. Until recently, most researchers looked for a single major cause for each mass extinction."
Now, I'm going to skip a paragraph and read another sentence. "Many paleontologists, however, think that most extinctions were caused by several factors."
And the cumulative effect of the passages I've just read is to say biologists propose, some

Page 292

biologists have thought single cause for major extinction, other biologists propose multiple causes for extinctions, and I think this illustrates the idea of uncertainty as to the cause of mass extinctions, as highlighted by that passage.
Q. And mass extinction, is that separate from just -- when you're talking about extinction, does mass extinction mean something different?
A. Yes, it does because very careful studies, the diversity of life on earth, that were carried out by Jack Sepkoski have indicated that at five or six times in earth's natural history there was a dramatic reduction in the diversity of life, as Sepkoski put it, a mass dying. And these mass dyings, the one with which most lay people are familiar, is the last major extinction known as the Cretaceous extinction in which the last dinosaurs disappeared. But the greatest of all of these extinctions is called the Permian extinction, and I think -- I'd have to read Jack's papers again, but between three quarters and two-thirds of all living genera, of all categories of species, perished in the Permian extinction. So it was indeed a great die-out.

Page 293

These mass extinctions are so well defined and so profound that it's been widely assumed that some great catastrophe must have happened to this planet to cause them, and that's what these passages have been about.
Q. Is it accurate to say, though, that the question of extinction is still an open question in the scientific community?
A. The question of exactly what caused routine extinctions or these great mass extinctions is indeed an open question in the scientific community.
Q. And that would be the same with the question about how new species arise? It's still an open question in the scientific community?
A. The exact forces that produce new species, how important, for example, ecological isolation might be and geographic isolation might be in terms of the formation of new species is indeed an unsolved question in biology.
Q. Is it just those two factors that's an unsolved question or --
A. No, there are always other factors and what are known as reproductive isolating mechanisms.

Page 294

the way in which one group in a population is separated from another by reproductive isolation is widely regarded as being essential to the formation of a new species, and people disagree as to which reproductive isolating mechanism is most important in most cases.

Q. And the third category is how life began?

A. Right. This is one that Joe and I paid a great deal of attention to.

Q. Why is that?

A. We paid a great deal of attention to it because it's an area in which there is little direct fossil evidence and a great deal of experimentation, some of which has been controversial. So, for example, we talk on page 424 of our textbook about experiments done by Stanley Miller and Harold Urey, and these experiments have been widely criticized by people in the intelligent design community and young earth creationists and just about everybody who's opposed to evolution.

So Joe and I sat down and we read all of the original papers written by Stanley Miller -- no relation I should point out -- on these experiments to make sure that we give a fair and accurate

Page 295

summary of them, and what we did is to summarize the Miller/Urey experiments that were done with primitive earth atmospheres in the 1950s this way, and the results of the experiments were spectacular. Over a few days several amino acids, the building blocks of proteins began to accumulate.

Now, a boldfaced sentence, which for our book means a way of telling students this is a key idea, "Miller and Urey's experiments suggested how mixtures of the organic compounds necessary for life could have arisen from simpler compounds present on a primitive earth." Then we qualified it in a very important way. I'll continue to read, "Scientists now know that Miller and Urey's original simulation of earth's early atmosphere were not accurate. However, similar experiments based on more current knowledge of earth's early atmosphere have also produced organic compounds. In fact, one of Miller's experiments in 1995 produced cytosine, c-y-t-o-s-i-n-e, and uracil, u-r-a-c-i-l, two of the bases found in RNA."

So that's what I mean by paying attention to it because we were afraid that an uncritical mention of the Miller/Urey experiments would have

Page 296

led to the charge that we are presenting discredited experiments. In fact, Stanley Miller's recent work has addressed some of these issues, and he still is able to produce these compounds.

On the next page, 425, I think is one of the pages that it is very important to point out in terms of how we talked about the uncertainty of the origin of life. The heading on this page is called "The Puzzle of Life's Origins," and the first sentence reads, "A stew of organic molecules is a long way from a living cell, and the leap from nonlife to life is the greatest gap in scientific hypotheses of earth's early history," and I think that's a fair statement.

We then describe a number of hypotheses about how first cells might have come together, and midway down the page we write, "Another unanswered question in the evolution of cells is the origin of DNA and RNA." I'll skip a sentence, and then I'll read, "How could this complex biochemical machinery have evolved?" Next sentence begins, "Science cannot yet solve this puzzle." Finally, in a figure, figure 17-10 on the bottom of the page, we summarize what most origin of life theorists and

Page 297

experimenters would think are the essential steps of going from a nonliving stew to simple organic molecules to RNA nucleotides to self-replicating RNA to modern genetic machinery, and as you'll see, the essential steps of this are peppered with question marks to indicate uncertainty. So I think we do a good job of illustrating uncertainty about how life first originated.

Q. Now, you described the strengths and weaknesses. Could you not also describe a weakness as a gap?

A. Well, you'll have to help me with exactly what you mean by a gap. If by a gap you mean an unanswered question, then science -- all of science, not just biology, is filled with gaps because science is filed with unanswered questions.

Q. Is it possible of those three categories that we just discussed, how new species arise, shy species become extinct and how life began, is it impossible to categorize any one of those as being more controversial than the others within the scientific community?

A. No, I don't think so. I think they're all controversial but not perhaps in the sense that you

Page 298

imply. They're controversial in the sense that many competing hypotheses are offered to explain each of them. I'm unaware of any controversy with the scientific community that says new species arise through supernatural creationism or progressive creationism or something along that line, for example.

Q. You're going to have to excuse me for jumping around a little bit here because I'm going to try to cover a lot of material in a short amount of time. Are transitional forms of fossils, are they considered a rare fossil find?

A. Their rarity depends upon about how one defines transitional forms. The National Academy of Sciences in a report several years ago pointed out that nearly all fossils in one sense or another can be regarded as transitional forms because nearly all fossils can be placed in a sequence where they are transitional between the forms that preceded them and the forms that followed them.

Q. Isn't the method of doing that, though -- and I know you said you're not a paleontologist, but my understanding is they take fossils and they categorize the fossils by-in-large by similarities

Page 299

in body parts and then line them up and draw inferences from what they can see from the fossils lining up?

A. Well, I think you're oversimplifying. I think the inferences are drawn not just by, as you put it, lining them up but also considering the detailed internal structure of the organism that produced the fossil, the geological age in which the fossil is found, the context in which the fossil is found, is it terrestrial, is it marine, is it aquatic, and the environment, the ecology in which the fossil is found.

It is possible to look at fossils and rocks and determine if they came from a wet area, a dry area, a jungle, a plain, a lake bed, and I think all of those considerations go into placing fossils in an evolutionary or an ancestor-descendent relationship.

Q. Would that be an example of historical science where you look at the observations, the evidence and then you draw inferences from it?

A. Well, I think looking at the evidence and drawing inferences from it is a characteristic of all science, not just historical science.

Page 300

Q. But in this case -- and I believe you were addressing a little bit of this in your testimony in Georgia -- people were questioning you well, how do you test or how do you know one fossil led to another fossil? How do you experiment on something that occurred in the past?

A. Well, the simple answer is one can experiment on events that happened in the past because the past left material evidence behind. When we look at a fossil, we're not making hypotheses about what happened in the past. We're looking at what existed in the past because we have the actual physical record in the same way that forensic investigators investigating the scene of a crime that took place yesterday or last week or last year depends upon physical evidence left behind at the scene of a crime. A paleontologist works on physical evidence left behind from previous life forms. So I don't think, therefore, it's quite as hypothetical as you make out.

Q. Well, from the evidence they look at, they draw inferences from that to satisfy or try to disprove a hypothesis that they may be approaching, whether or not something is a transitional form, for

Page 301

example?

A. All of science consists of looking at the evidence and drawing inferences from it, and in that respect, paleontology is not exceptional.

Q. Is there a way in which paleontologists conduct an experiment in the lab to disprove the hypothesis that they may have?

A. Yes, paleontologists very frequently conduct experiments in laboratories in which they analyze the isotope composition of organisms, for example, to try to determine what their diet may have been or where they have lived or how active they were. To give another example, one major area of interest among paleontologists is whether or not dinosaurs were, in fact, warm blooded, and the nature of the experiments that they conduct involve taking soft tissue when they can find it and analyzing the composition of isotopes in that tissue to determine how active the animals were metabolically. If they were very active in terms of exchanging material with the environment, there's a strong inference that they may have been warm blooded.

Other types of investigations include

Page 302

investigating fossils experimentally using CAT scanners and magnetic resonance imaging to look at the concealed internal structure of bones and in some cases of soft tissue to determine circulatory patterns and other physiological parameters that might be consistent with a hypothesis about what the animal was actually like.

Q. Are there alternative scientific theories to the theory of evolution?

A. There are certainly alternate ideas to the theory of evolution, but because none of these ideas that I am familiar with has scientific support or scientific credence, I am unaware of an alternate scientific theory to evolution.

Q. Does chaos theory offer any alternate alternatives to the theory of evolution?

A. No. Chaos theory as I understand it is a mathematical based analysis of what you might call contingent change in which there's a certain unpredictability that can be built into any system of interacting parts, and that unpredictability in chaos theory could apply to a complicated machine, like a jet engine in an airplane, it could apply to a complex human institution, like a corporation, or

Page 303

it could apply to a complex chemical or biochemical system.

Now, since evolution is based on chemical and biochemical systems, there are applications of what I understand to be chaos theory to evolution, but I certainly don't see chaos theory as an alternate or competing hypothesis to evolution.

Q. I believe when you initially were explaining some of your expertise as a cell biologist, you stated that you engage in laboratory experiments; is that correct?

A. That's correct.

Q. Do you apply natural selection in terms of your experimental work when you go to the bench?

A. Not in the work that I do.

Q. Do scientists apply natural selection when they go to the bench and do their work in experimental --

A. It depends on the scientist and it depends on the experiment but very frequently they do.

Q. Do they also use design criteria when they go to the bench to perform experiments?

A. Scientists use the word, especially in biochemistry, they use the word design quite often,

Page 304

and they use the word design as a shorthand for the correlation of structure and function. So I have heard many seminars, for example, here where protein crystallographers will talk about how the active site of an enzyme was designed, and what they mean by that is -- they certainly don't mean intelligent design as its understood in the context of the Dover case, but when they talk about the design of part of the structure and the protein, its active site, they're talking about the way in which the function of the protein can be explained in terms of its structure.

Q. Now, Bruce Alberts, he is the head of -- do you know who Bruce Alberts is?

A. Yes, I do. He's a personal friend of mine. He is the current president of the National Academy of Sciences, the most prestigious scientific body in the United States.

Q. Doesn't he advocate, you know, for future biologists to have training as engineers?

A. He wrote an essay, which I believe appeared either in the journal Cell or Molecular Biology of the Cell -- you might know which one -- entitled, "The Cell is a Collection of Protein

Page 305

Machines." The subtitle is, "Educating the Next Generation of Cell Biologists," and I sometimes assign that article as assigned reading in the beginning of the upper level cell biology course that I teach here in the fall semester.

What Bruce pointed out in that article is that our understanding of the way in which the cell functions at the level of a molecule is advancing to the point that cell biologists can no longer be trained just in microscopy and tissue staining techniques and cinema techniques to photograph cells moving, they also have to understand the basic elements of protein structure and engineering, as he put it. In other words, the principles that determine how proteins fold, how they interact with each other and how protein enzymes catalyze chemical reactions.

Q. And don't they operate similar to, as the title would suggest, as molecular machines?

A. Well, we often talk about individual proteins or collections of proteins as being part of the DNA replication machinery, the protein synthesis machinery or the ion transport machinery. So the answer to that is yes. And we use, of course, the

Page 306

word machine as a metaphor where we regard the protein as a collection of interacting parts in a way that is similar to the machines that we're familiar with here in the human world.

Q. Well, with regard to its use as a metaphor, does it not also have practical use in the sense that when scientists go to the bench to do work, they will use reverse engineering techniques to help them solve a problem? For example, break a component of the machine, see how the machine functions; remove a component of the machine, see how the machine functions. Is that not a design approach to experimentation?

A. I don't know if it's a design approach or not. I do know that it is indeed a very common approach. One of the techniques that is widely used by molecular biologists is known as the knockout technique. And in order to understand the function of a particular gene, there's a well-defined technique in which we will take that gene and knock it out, destroy it if, for example, a mouse embryonic stem cell, and then we will grow a mouse that lacks the gene and basically see what happens.

So I'm not sure why or how I would apply

Page 307

the word design to that, but one classic way to understand the importance of a particular component of a system is to take that component away and see how the system works.

Q. One of the examples that -- and I believe you may have had it in your report but I see time and again is pointing to developing drugs -- and actually, I believe in your report you said design new drugs are used, something along those terms, in antibiotic resistance. I believe it's on page three, and you state, "Evolutionary theory is used to design new drugs based on the process of natural selection," and then the sentence continues.

How is it that the process of natural selection helps us to design new drugs? Can you explain how that occurs?

A. Sure, I'd be very happy to, and I'd be happy to cite a number of papers that talk about the use of directed selection, which is a process in the laboratory which uses Darwinian principles to basically allow a system to evolve to fit a receptor or to catalyze a chemical reaction or to inhibit a chemical reaction, and the papers that I'd be happy to cite basically describe setting up under

Page 308

laboratory conditions a Darwinian process that allows natural selection guided to some extent by the investigator to come up with the best molecule to bind to a receptor, catalyze a reaction or inhibit a reaction, and the statement is often made in these research papers that the final solution that natural selection arises at is actually much better than anything that the scientific investigator could have designed by rational design on their own ahead of time, and that's why the use or the exploitation of the Darwinian evolutionary method is useful in terms of designing drugs and other compounds.

Q. You said Darwinian principles. What are the principles that you're specifically referring to?

A. The Darwinian principles I'm talking about involve variation, natural selection and what we sometimes call differential reproductive success. In other words, allowing a system to vary widely, setting up a process that mimics natural selection or to pick out which of many variance fits the target the best in the case of drug design and then allowing that selected system to reproduce and vary

Page 309

some more and keep going through rounds of variation mutation, if you will, in natural selection to find the best possible fit, the best possible inhibition or the best possible catalyst.

Q. Does that not then point to the limits of evolution or limits of natural selection --

A. You have to help me with what you mean by pointing to the limits.

Q. Well, for example, an antibiotic resistance if you're trying to find the antibiotic that the bacteria cannot adjust to be able to knock it out, is that not then demonstrating the limits of natural selection?

A. Well, first of all, I'm unaware of any antibiotic that bacteria cannot evolve resistance to, and if you found one, then we have the solution to all bacterial infections that afflict mankind, and it would be nice to know about that. I'm not sure if you're pointing to a paper that was published last year by Barry Hall, a researcher at the University of Rochester, and it has been cited by Professor Michael Behe. Are you? I'm just curious. This citation appears in Dr. Behe's expert report, and then you referred to the limits of

Page 310

evolution. Is that the reference that you're making?
Q. Well, let's take this in pieces. Tell me about the Barry Hall study that you referenced.
A. The paper by Dr. Hall, which I think was published in 2004, and I have the paper in my office, and I'm going to apologize for being unspecific about some of the details, but it concerns a particular antibiotic, and the antibiotic, I believe, is in the penicillin class of antibiotics. It's not penicillin, but it's in that group of antibiotics, and Hall had noted that in some bacteria there is a particular enzyme that is associated with resistance to this antibiotic, and I believe that enzyme -- and I apologize if I have this wrong -- but I believe that enzyme falls into a class of enzymes known as beta -- that's the Greek letter beta -- lactamases, l-a-c-t-a-m-a-s-e-s.
Hall addressed the question as to whether one particular beta lactamases could be changed by natural selection, by evolution, to produce resistance to this one antibiotic? The results of his analysis was that it was very unlikely that this one particular enzyme could ever become more

Page 311

efficient than it currently is in promoting resistance to this antibiotic.
Now, I don't have Dr. Behe's expert report in front of me, but I do believe -- and I apologize if I have some elements of this wrong. I could get them right by referring to Dr. Behe's expert report if you have a copy. But in his expert report, Dr. Behe gives a fair summary of these experiments, but then, quite frankly, he makes a misstatement, and the misstatement might have been inadvertent, and I can certainly excuse Dr. Behe that.
The misstatement in Dr. Behe's expert report is the claim that Dr. Hall concludes that bacteria cannot evolve resistance to this antibiotic. That's not true. What Dr. Hall actually concluded was that evolutionary modification of this one enzyme in this bacteria -- the bacteria can make thousands of enzymes, but modification of this one enzyme will never produce any stronger resistance to the antibiotic than exists now. And saying that beta lactamases is never going to get any better in chopping up this antibiotic is not the same as saying that the whole organism cannot evolve resistance to it, and I

Page 312

believe that's a misstatement that Dr. Behe made in his expert report.
I know I don't get to ask the questions, but are you looking at Dr. Behe's expert report?
Q. I'm looking at Dr. Behe's rebuttal report, and there's a reference to Barry Hall, and I'm going to ask you this question because he has this in bold and see if you agree or disagree with this point.
A. Sure.
Q. Dr. Behe states it is critical to the development of better antibiotics, pesticides and drugs to determine the limits of Darwinian evolution?
A. So you want to know if I agree or disagree with that statement?
Q. Yes.
A. I would rephrase it, and then I'd have something that I would agree with completely. And that is that it is very important to the development of better antibiotics and better drugs to model the development of those drugs on what evolution is capable of. So, for example, one of the items that Dr. Behe, I believe, brought up in either his expert report or his rebuttal report is the modern

Page 313

three-drug regimen that is used to treat AIDS patients, and that three-drug regimen was developed precisely with a profound understanding of the way in which the HIV virus evolved resistance to individual drugs, and it was designed with a knowledge and understanding of the process of evolution by using multiple drugs that understanding could be exploited to make it very unlikely that HIV would eventually evolve resistance to all three drugs at the same time.
So what Dr. Behe talks about is understanding the limits of evolution or even simply saying understanding the capabilities of evolution and trying to design drugs and therapies which will understand those capabilities and in advance will plan against them because evolution is real, evolution will take place and no person, no physician can treat infectious disease effectively without understanding evolution and taking it into account when they devise a therapeutic strategy.
Q. When scientists are trying to determine a bacteria's resistance to certain antibiotics -- and this may not be a proper analogy or metaphor -- I guess more like a metaphor -- is it more like carpet

Page 314

bombing in terms of throwing a great deal of antibiotics at the bacteria to see what it's resistance might be to various ones as opposed to the contrary one being a surgical strike if you knew exactly the design of the bacteria?

A. Well, the question that you asked me was when they are trying to determine the resistance. What you do under those circumstances is carry out a series of experiments to determine the effective dose of the antibiotic and its effect on growth. So you would usually set up 10 or 15 parallel cultures in which you use different concentrations of an antibiotic against a common population of bacteria and see basically as you added more and more antibiotic, what was the critical concentration that was necessary either to inhibit growth or to kill all of the bacteria. So you say when you evaluate resistance, that's how you evaluate resistance.

In terms of trying, I think as you put it, to design an antibiotic that would be effective against bacteria, most antibiotics that I am aware of have not been designed from scratch but are rather products of other bacteria or fungi or other organisms in nature. Penicillin, as I'm sure you

Page 315

know, is the product of the penicillia molds, and it is a compound that closely resembles a cell wall carbohydrate that the bacteria normally puts into its own cell wall, and the reason penicillin is effective is because this compound produced by a fungus mimics a carbohydrate in the bacterial cell wall except the bacterium is unable to cross link it into the wall.

So, to use the analogy of a brick wall, what the bacteria does is when it's building its brick wall and cementing it all together, every now and then it produces a brick that can't be cemented in place. So the first time there's any stress in that wall, that brick flies out, there's a hole in the cell wall, and the bacteria is destroyed by a process called osmosis. So that's basically how penicillin works.

Most antibiotics work on that principle or they inhibit bacterial protein synthesis or they inhibit some other aspect. The major antibiotic families have all been found in nature and then tinkered with in the laboratory of pharmaceutical scientists designed to make them more effective against their targets.

Page 316

Dr. Behe, for example, writes about the limitations of evolution. It's unfortunate that evolution is, to be perfectly honest, not that limited with respect to the evolution of antibiotic resistance, and we have yet to find any bacter – excuse me, we have yet to find any antibiotic to which bacteria are incapable of evolving resistance, and that's one of the reasons why new antibiotics over time lose their effectiveness.

(Recess.)

BY MR. MUISE:

Q. Dr. Miller, I'd like to refer you to your report, which I believe we marked as Exhibit 4, and in particular page eight where you analyze in some respects the language of the Dover statement as you caption that section. Do you see that section, sir?

A. Yes, I do.

Q. The statement that you have retyped in your report, is it your understanding that that's the complete statement that's read to the students?

A. I believe it was. I've never been provided with a copy of the complete statement. So I don't know if that's the complete statement or not, but that's all of the statement that I am aware

Page 317

of.

Q. Well, if I represent to you that at the beginning of the statement it has a sentence which is set up as a separate paragraph, and then there's a final sentence, both of which you left out of your statement and your report.

A. Okay. I now realize when I look at my expert statement that I said which said in part, and I believe that I relied on reports of the statement as published in the York Daily Record for these excerpts. So, yes, you're right; I realized at the time I wrote this that this was not the complete statement, but right now I cannot remember what parts might have been left out of the statement as I produced it in the report or anything else.

Q. Well, let me just represent to you -- and this is an exhibit that was attached to the answer in the complaint, which lays out what the statement was. The first sentence, which is set off as a separate paragraph, is, "The Pennsylvania Academic Standards requires students to learn about Darwin's theory of evolution and eventually take a standardized test of which evolution is a part." So that statement would be made before the beginning of

Page 318

the first paragraph in your statement.
Then the last sentence is, "As a standards-driven district, class instruction focuses upon preparing students to achieve proficiency on standards-based assessments." Were you aware that this statement began and ended in those paragraphs I just read to you?
A. To be perfectly honest, I can't remember if I had seen a copy of the entire statement that had those sentences or not, but I may have, and it certainly is understandable that it would be couched that way by the Dover Board of Education.
Q. And why do you say that?
A. Because much of the language -- again, I only know what I read in the papers -- that I've read in the York Daily Record has emphasized the discussion, the public discussion in front of the Board of Education, has taken place in the context of reminders pointed out by school administrators, by board members and occasionally by teachers that whatever Dover decides to teach it has to do so in the context of the Pennsylvania State Standards and the standardized tests that their students have to take and pass.

Page 319

Q. And you don't disagree with that I'm assuming?
A. I certainly don't disagree with that.
Q. Is there a reason why you left it off or out of your report?
A. Not that I can think of. I think when I took parts of the statement, I wanted to highlight those parts of which I was critical. I certainly did not represent this in my report as being the complete statement. There would have been no point in doing that since you had already provided that as the answer to the complaint, and I clearly wrote in the statement it said in part, indicating that I had not reproduced the whole statement here.
Q. Does the inclusion of those additional parts that I read to you change any of your opinions regarding this statement?
A. No, it does not.
Q. Let's look at the statement as you represented it on page eight. The first line says, "Because Darwin's theory is a theory, it continues to be tested as new evidence is discovered." Is that statement true?
A. That statement is true, but it also

Page 320

applies to all scientific theories.
Q. The second sentence, "The theory is not a fact;" is that true?
A. That is a true statement. However, it's a statement that seems to me to be designed to mislead, and what I mean by design to mislead is no scientific theory is a fact or ever becomes a fact. So by singling out evolution and saying that theory is not a fact, it leaves the implication that perhaps there are other scientific theories that are facts or are factually based, and if that was the intent, that would certainly be a misrepresentation.
Q. Would it not also be a misrepresentation to confuse the term evolution with the theory of evolution in claiming that evolution is a fact, and what I'm saying is we've gone through and you were pointing out how it's important to be precise about our definitions, and there is evolution and there is the theory of evolution; is that correct?
A. In light of our previous discussion about the two meanings of the use of the word evolution, that is correct.
Q. And evolution in the first meaning, sort

Page 321

of the historical sense, is more akin to a fact, correct?
A. I certainly think that, yes.
Q. Whereas the theory of evolution is not a fact?
A. No scientific theory is a fact, and the Dover statement is very clear, that it uses the theory of evolution in the second sense because the statement says Darwin's theory is a theory, and when you talk about Darwin's theory, you are specifically talking about descent with modification and natural selection.
Q. In Cobb County, I believe, did that sticker say evolution is not a fact? It didn't identify it as the theory of evolution is not a fact?
A. The Cobb County sticker said, "This textbook contains material on evolution. Evolution is a theory, not a fact, regarding the origin of living things," and the third sentence I jumble around a little bit, students are urged to -- students are urged to critically examine this material, to study it carefully, and to consider it with an open mind. That's almost the exact wording

Page 322

of the Cobb County statement.
Q. But in here the Dover statement again identifies that the theory is not a fact, and you don't dispute that?
A. I don't dispute it, but again, pointing out that one scientific theory among all scientific theories is not a fact is a bit unusual, unless it's designed to called that particular theory into question.
Q. When we looked at previously the Pennsylvania state standards when they have it as a standard to critically analyze scientific theories, I'm assuming your view would be to critically analyze all scientific theories, correct?
A. My view would be that an important part of science education is the critical analysis of all scientific theory, not singling any of them out, as this statement unfortunately does, for special attention.
Q. And on the Pennsylvania state standards they explicitly list five particular theories?
A. No, they give five theories as examples of the kinds of scientific theories might be critically evaluated, but the context of the Pennsylvania

Page 323

statement is very clear that those are not the only five theories that should be critically examined, but these are examples of theories that should be critically examined.
It's also worth noting -- and I hadn't noticed it until now -- that the portion of the Pennsylvania state standards that you're referring to doesn't apply to students in 9th or 10th grade. It's applies to students in 12th grade.
Q. Well, I think actually the correct way to read that is it has to be accomplished by the 12th grade. So it can be 9th through 12th.
A. Absolutely, understand.
Q. The third sentence, "Gaps in the theory exist for which there is no evidence;" is that a true statement?
A. It's a statement that I have trouble understanding. I'm unaware of any gaps in evolutionary theory. I certainly am aware of gaps in the fossil record, of gaps in our understanding of the origin of life on earth, but evolutionary theory is a system of explanations designed to explain facts, and I'm unaware of any gaps in theory in the sense of scientific observations made in

Page 324

nature that evolutionary biology is incapable of explaining or accommodating.
Q. Well, are there gaps -- for example, using the fossil record, are there gaps in the sense that we are missing certain transitional fossils?
A. The fossil record is necessarily incomplete, and we do not have a complete record of all life on earth, and when you say are we missing certain transitional fossils? When you're missing something, almost by definition you don't know what you're missing because it's not there. So there certainly are periods of time, and there are geographic locations in which the fossil record is incomplete. That's a fair statement.
Q. We were referring to before the strengths and weaknesses that you identify in your textbook. Are not those the weaknesses that you're referring to are in reference to the theory?
A. Let me turn to that page.
Q. The caption is "Strengths and Weaknesses of Evolutionary Theory."
A. And what we wrote, of course, is like any scientific theory, evolutionary theory continues to change. Researchers still debate such important

Page 325

questions as precisely how new species arise and why species became extinct. There is also uncertainty about how life began, and I think all of that reflects not a gap in the theory, but it reflects phenomena that we observe in nature that we cannot as yet fully explain.
Q. Well, is there not a weakness in the theory as your title would suggest?
A. I certainly think that one of the weaknesses of evolutionary theory, as it would be a weakness of all scientific theories, is it cannot provide a complete explanation of everything you see in nature, and I would also point out that atomic theory does not provide a complete explanation of everything, every behavior that we see in matter or in chemistry.
Q. So if we replace the word gaps with weaknesses, would that not comport with what you wrote in your biology textbook?
A. Yes, I think very well it might, and as you know, on page nine of my expert report that one of the problems I have with that particular part of the statement is -- and I'm reading from the report now -- "Students and teachers in Dover must be left

Page 326

to speculate as to what the board might mean when it tells them that gaps in the theory of evolution exist for which there is no evidence."

And skipping a little bit farther down also on the same page I wrote, "Because the gaps are unnamed because the board -- unlike our textbook, the board did not say what those gaps might be. They cannot possibly be addressed in a factual manner even by teachers well versed in the scientific evidence for evolution."

Q. Why can't the teacher point to your book?

A. The teacher can certainly point to strengths and weaknesses in the book, but as to what the board might mean by evolutionary theory of gaps in theory because the board was not specific about what those gaps might be, there is no way for a teacher to say here is what the board meant and here is what the gaps are. The board never said.

Q. So, in your view then, it would be -- it would be satisfactory if they identified what those particular gaps were?

A. Rather than saying it would be satisfactory, what I would say is it would serve a useful educational purpose because teachers would

Page 327

then be able to say to students here is what your board of education thinks the specific problems or weaknesses are with evolutionary theory, and that might enable the teacher to look into the evidence or lack of evidence for those particulars areas.

Q. Well, the fact is that the teacher is going to be teaching evolution pursuant to the Pennsylvania state standards, correct?

A. That's my understanding.

Q. And pursuant to what your book presents to the student, correct?

A. If that's the decision of the teacher using my book, yes.

Q. So you would consider it unreasonable for a teacher to point to where you identify weaknesses of the evolutionary theory to explain where there are gaps in the theory?

A. I wouldn't consider it unreasonable, but I would consider it an extrapolation of the unspecified meaning of the statement by the board. In other words, if the teacher said here's what the board meant when they said gaps and then pointed to the page in our textbook that you referred to, that teacher would basically be pretending to know the

Page 328

meaning of the board, and I'm not sure they do, and I'm not sure the board ever made explicit what it regards the gaps as being.

Q. Now, the second sentence, "A theory is defined as a well-tested explanation that unifies a broad range of observations;" is that true?

A. Yes, I think that's fairly good, and I wrote in the expert statement that I thought that was a correct and proper description of the theory.

Q. Does that properly define the theory of evolution?

A. Yes, I think it does.

Q. Third paragraph, "Intelligent design is an explanation of the origin of life that differs from Darwin's view," and I know from your report one of the points you take issue is the fact that it's an explanation of the origin of life; is that correct?

A. Yes, my understanding of intelligent design, as I got from reading the literature from the intelligent design movement, is that intelligent design includes the origin of life answer, it was designed, but it also includes a great deal more, and the specific reference to the Dover statement that I objected to was the clause that says that

Page 329

that explanation differs from Darwin's view, and as I pointed out, Charles Darwin never published any detailed theory for the explanation of the origin of life beyond speculation in letters to a few other scientists that life might have originated in what Darwin called a warm, little pond, but a statement like that hardly amounts to a theory for the origin of life.

Q. In that statement it says, "An explanation of the diversification and origin of life that differs from Darwin's view." Would that be an accurate statement?

A. I think that would be a more accurate statement, yes, it would.

Q. The next sentence, "The reference book 'Of Pandas and People' is available for students who might be interested in gaining an understanding of what intelligent design actually involves." Do you have any problem with that statement?

A. No, I think the fact that the board has provided that book, made it available to students, and that they have characterized it as a book on intelligent design, that's all a fair statement. So I think that particular statement is something that

Page 330

effectively communicates the reality of the situation to students, which is we got this book, it's available for you, and this book describes intelligent design.

Q. And I believe from one of your earlier statements, you would defer to the judgement of the board as to such matters of what books go in the library and so forth?

A. Yes, I certainly think as a matter of principle that individual school districts should be quite free to put any books in their libraries that they want. Now, if I was asked instead for my own scientific judgment as to how variable an education resource "Of Pandas and People" would be, my judgment would be very critical, and part of my expert report, in fact, points out a number of serious scientific errors and misrepresentations in "Of Pandas and People."

So I would specifically if asked for advice say, I don't think this is a very good book, but the decision of what books to put in a library and make available is of a different matter -- of a different order.

Q. And then finally, "With respect to any

Page 331

theory, students are encouraged to keep an open mind." I'm assuming you don't have a problem with that?

A. I don't have a problem at all, but again, that statement in the context of the Dover statement is in a way self-contradictory because the statement says with respect to any theory keep an open mind, that's good advice, but what the Dover board has done is to call only one theory in for doubt and criticism, and that's the theory of evolution.

So rather than asking students to keep an open mind on all theories, the board it seems to me has adopted a statement that is specifically designed to undermine the creditability of the theory of evolution.

Q. Have you spoken to anybody in the Dover School District that told you their purpose is to undermine the theory of evolution?

A. No, I have not.

Q. And as we identified previously, the only theory that's being taught in the class is evolution and using your textbook as the primary textbook for that, correct?

A. No, that's not correct. The only theory

Page 332

that's being taught is not evolution. I would assume atomic theory is being taught, germ theory of disease, the cell theory, the pressure flow hypothesis of flow and transport is covering the plant section of the book. I assume they covered all of those things. So there are many theories that are being thought. The only theory, as far as I can tell, that's being called into question that students are urged to keep an open mind about is the theory of evolution.

So there's no question that this statement is intended simply by a simple reading of it to call the theory of evolution into question.

Q. Why can't you read that statement as calling into question the theory of intelligent design?

A. Because the theory of intelligent design is, as far as I could tell, not mentioned and certainly not cited as a theory in which -- sorry. Obviously I retract that because I'm wrong about that because it does mention intelligent design. The -- it says with respect to any theory. The only theory specifically cited is Charles Darwin's theory of evolution.

Page 333

Intelligent design, as I understand it, unless the excerpts that I've made here have left something out, intelligent design is not mentioned as a theory. Intelligent design, I believe, is mentioned "as an explanation of the origin of life that differs from Darwin's view."

Q. And so it's your view then that that's not referring to intelligent design as a theory?

A. As far as I can tell from reading the statement, I don't see any reference to intelligent design as a theory. So I don't see students being urged to keep an open mind with respect to intelligent design. Now, perhaps I'm misreading it, but that's certainly the wording that I see.

Q. And if you are, in fact, misreading it, does that change your view?

A. If I am misreading, misunderstanding, misconstruing anything, it would change my view, but I don't think I'm misreading it.

Q. If the board intended intelligent design to be a theory but, in fact, just didn't say intelligent designer theory but just described it as intelligent design, could the statement not be read for students to keep an open mind about intelligent

Page 334

design?
A. If the board had said that, I would certainly read it that way, but as far as I can tell, they didn't say that.
Q. And the last sentence, "The school leaves discussion of the origin of life to individual students and their families," and you state in your report you have some difficulty with that?
A. Well, the difficulty I have with that is I'm confused by it because the school specifically says that intelligent design is an explanation of the origin of life, and it mentions that there's a book in the library, but then it says it leaves the discussion of the origin of life to individual students and their families.
So I'm not sure if students are told visit the library to learn about the origin of life, talk about it with your families or it's going to be covered in your biology class as a part of the state mandated coverage of evolution. So it's not that I object to that, but I am confused by it.
Q. Well, I think as I represented to you previously, the superintendent has issued an official statement as to the implementation of the

Page 335

particular policy, and one of the things that was made clear is that intelligent design is not going to be taught in the classroom. Does that help clarify this for you?
A. I haven't seen that statement, but if I had seen it, I'm sure it would help clarify.
Q. Well, if I can represent to you that that statement was, in fact, made, does that help clarify your confusion about that last point, and I don't mean your confusion but your claim that it's confusing?
A. Well, no, it is my confusion because we are told that this is a standards-driven school district, that the standards require discussion of Charles Darwin's theory of evolution, and we are also told up here intelligent design is an explanation of the origin of life that differs from Darwin's view, and that implies that the origin of life is taught in the classroom, but then the concluding sentence implies that the origin of life is left to individual students and their families.
So just trying to piece all of the statements together, I am left in a state of some confusion as to whether origin of life is to be

Page 336

taught in the classroom, is to be considered by students reading "Of Panda and People" in the library or is to be left to students and their families to talk about at home. Now, that's not an objection. That's just saying when I read this, I don't understand what the intent of the board is.
MR. MUISE: Did you have an objection you want to state?
MR. WALCZAK: Well, I guess the objection is that let's give full context in that, first of all, the instruction may be that it's not -- that intelligent design is not to be taught but, in fact, this statement is read, and people may differ as to whether or not reading this statement to students counts as teaching them this or not.
The second part of what my understanding is about how this is implemented is that the superintendent has said that teachers are not allowed to answer any questions about intelligent design. So after reading this statement if some student asks well, who's the designer,

Page 337

the teachers are not allowed to answer that.
MR. MUISE: And just so that I can be clear, I'm objecting insofar as the attorney is testifying in this deposition.
MR. WALCZAK: Well, I mean if we're going to posit what the context is to the extent it's not in here, let's make it complete.
MR. MUISE: Why don't you mark this as the next exhibit.
(Defendant's Exhibit No. 13 was marked.)
BY MR. MUISE:
Q. I'm handing you Exhibit 13, which is a press release, which I'll represent to you according to the complaint is considered part of the policy that is being challenged in this particular case, and I'll direct your attention for purposes of the time issues we have here, if you look at the very last paragraph -- actually, it's the second to last paragraph on the second page.
A. Okay. What would you like me to do?
Q. That last paragraph represents and according to the complaint how this statement and the curriculum change is going to be implemented.

Page 338

Do you see that?
A. Yes, I do see the paragraph.
Q. Does it state in there about how teachers should address or handle any questions if students ask?
A. What I see is that no teacher will teach intelligent design, creationism, or present his or her or the board's religious beliefs. Intelligent design creationism seems to be lumped in with religious beliefs. We're not going to discriminate against students who disagree. The board knows that there are opinions other than Darwin's on the origin of life. Again, a statement I found confusing because Darwin didn't have a strong opinion on the origin of life, and some generalizations about critical discussion. I don't see anything here about answering questions.
Q. Would you agree with the statement that school districts are forums for inquiry and critical discussions?
A. I think school districts can be forums for inquiry and critical discussion, but I think they're also institutions built around the transmission of knowledge, and properly passing on what we

Page 339

understand about mathematics, about history, about the arts and about the sciences is also a function the school districts.
Critical analysis of all scientific ideas is a part of scientific training, and to the extent that all scientific ideas are critically analyzed, I would agree with a statement like this.
Q. In that last sentence of the same paragraph, "Providing" – I'll change provide to providing – "Providing an opportunity for open critical discussion," would you consider that to be a legitimate educational goal?
A. Oh, I certainly would agree that as this statement reads, "Providing an opportunity for open critical discussion" is, as the statement says, the real heart of scientific practice, but I would also point out that that open critical discussion should be about everything in science and not about one particular scientific theory.
Q. In our remaining few minutes, I want to ask you some questions about your criticism of the Pandas book.
A. Okay.
Q. And you in your report list several

Page 340

criticisms of the Pandas book as a science text, correct?
A. I do.
Q. Are those your major criticisms of the text?
A. Yes, I think that's fair to say. I'm sure I could come up with others if you give me time.
Q. Well, we have your report, and that's what's in the report, correct?
A. We do indeed.
MR. MUISE: Can you mark this as Exhibit 14, please.
(Defendant's Exhibit No. 14 was marked.)
BY MR. MUISE:
Q. Now, you state on page 19 of your report that "Not a word can be found anywhere in Pandas regarding the age of the earth." Is that a misstatement?
A. I assume you're going to point out to me that it is a misstatement. Let's see.
Q. On page 94 --
A. Certainly that statement was incorrect when I wrote that not a word can be found. I think

Page 341

that reference to the geological ages that appears in Pandas – and you can see it here – is actually predicated in a very tentative way that makes it clear that Pandas does not take a position on the age of the earth, and you can see that in a couple of places, I think. A parenthetical statement in the bottom of the left-hand column on page 94 says, "If one takes the standard dating scheme of the earth's strata, 30 million years is almost momentary." So it says basically if you accept this great answer for the earth, then this is a very short period of time.
So I think what Pandas does at this point -- and I have to retract what I said that it doesn't have a word because it's got several words. I think what Pandas does is basically say well, if we take what evolutionists tell us the age of the earth is and we play by the evolution of scheme, there are still problems with that scheme, and that's what Pandas seeks to point out.
Q. Now, that parenthetical that you referred to, "If one takes the standard dating scheme of the earth's strata," could that not also be read according to the standard dating scheme of the

Page 342

earth's strata?
A. It certainly could be read that way, but when you say if one takes, that tells students we don't have to take that. We can reject if we want, and we can hold to, for example, a young earth view.
Q. You would agree, though, according to the standard dating scheme, 30 million years is a momentary period of time?
A. Thirty million years is I would not say a momentary time. I wouldn't characterize that at all. I think 30 million years is a very, very long time, especially since we have examples of new species arising under human observation in periods of time as short as 300 or 400 years. So, no, I don't agree that 30 million years is momentary. Thirty million years -- many of the geological periods stretch for in the neighborhood of 20 to 30 to 40 million years. So it's a pretty long period of time, and a lot can happen in 30 million years.
Q. Well, isn't that 30 million years in terms momentary just in reference to the age of the earth, which is what, four to five billion years old; isn't that correct?
A. Thirty million years -- this passage that

Page 343

you're pointing out to me does not make reference to 4.5 billion years to the age of the earth, and I'm not sure if Pandas does. Perhaps there's another passage you can point out to me where it points out 4.5 billion years. I haven't noticed it. So the 30 million years here is not presented in comparison to the age of the earth itself, but it's presented sort of as an absolute value that's a geological instant or momentary period of time.
Once again, you know, I just don't agree that 30 million years is, momentary, and just to sort of drive home that point, if we were to take the present age and we were to go back 30 million years, there are no humans, there no hominids, there are no modern horses, there are no modern elephants. The shape of the fauna and flora of this planet 30 million years back from the present time was dramatically different from what it is today. So I think 30 million years is a significant period of time.
Q. But 30 million years in terms of the age of the earth would be contrary to those, at least one of the criteria of the creation science that we discussed earlier today?

Page 344

A. Yes, but remember the parenthetical statement says if you take the standard dating scheme holding open the possibility that one might not take the standard dating scheme, and that would be consistent with young earth creationists.
Q. And the second paragraph towards the bottom again refers to the Cambrian 500 million years or more of geological time. Again, another reference to the age of the earth, correct?
A. That is a reference to the age of the earth, and as I've already indicated, I obviously was mistaken when I said that Pandas contains not a word about this.
Q. The last point because I'm running out of time here. You said Pandas ignored the issue of extinction, and you go on to criticize it about that; is that correct?
A. I did say that.
Q. However, one of the strengths and weaknesses of evolutionary theory under that caption you quite plainly state that there is debate regarding the issue why species become extinct?
A. I do state that.
Q. But yet in your report on page 21, you

Page 345

say, "Evolution, of course, can explain extinction quite easily."
A. Uh-huh, and it goes on to say that, in fact, extinction is a major evolutionary mechanism. Now, saying that extinction is a major evolutionary mechanism is not the same thing as saying we know the exact causes of every extinction.
Q. You say here evolution can explain extinction quite easily?
A. That's exactly right, and the reason for that is because evolution points out that there is a struggle for existence between organisms here. It has limited resources, organisms are in competition with each other. Organisms were not perfectly designed to fill their environmental niches, and therefore, occasionally they fail in the struggle for existence. That's the respect in which evolution can explain extinction, that organisms fail in the struggle for existence.
The problem with intelligent designer theory and it's a problem so far as I am able to tell that is unaddressed, that is not addressed at all in Pandas is if the organisms that appear over time were indeed as Pandas claims they are

Page 346

intelligent designed, if they were intelligently designed, why did they fail in that struggle for existence? Why did they become extinct? Because it's perfectly clear that if you have an intelligent agent that is designing organisms that are perfectly suited to their environment, the notion that those organisms should disappear, that they should fail in the struggle for existence is inconsistent with the idea that the designer is intelligent. Suddenly it makes the designer looks rather unintelligent or at least unable to anticipate future events.

Q. I've got two more real quick questions. I'm going to ask you whether or not you agree or disagree with this statement, and it's been attributed to a Richard Halverson writing for Harvard Crimson.

A. I would point out as a matter of record that the Harvard Crimson is the student newspaper at Harvard.

Q. That's fine. "We must refuse to bow to our culture's false idols. Science will not benefit from canonizing Darwin or making evolution an article of secular faith. We must reject intellectual excommunication as a valid form of

Page 347

dealing with criticism. The most important question for any society to ask is the one that is forbidden."

A. I think that's sounds perfectly reasonable. I completely agree with it. I wouldn't want to see evolution canonized, I wouldn't want to see Darwin canonized, and I wouldn't want to see opposition to evolution -- I think that the word was excommunicated. And, in fact, it has been a source of continuing surprise to me why the advocates of intelligent design seem to excommunicate themselves from the scientific community.

I am always surprised that advocates of intelligent design do not show up at scientific meetings, do not present scientific papers and do not debate their ideas openly in the context of the scientific process.

Q. They've debated openly with you?

A. Yes, absolutely, and that's fair enough. But those debates have without exception been in public forums designed to deal with the general public, but I'll give you a very specific example. My colleague, Michael Behe, is a member of the American Society for Biochemistry and Molecular

Page 348

Biology. Every member of that society every year at the annual meeting is allowed to present a paper to the society. Insofar as I know -- and I could be wrong, but insofar as I know, Dr. Behe has never gone to the scientific meetings of his own society and presented his ideas on irreducible complexity to the scientifically informed or the audience refined to those meetings, and that behavior is characteristic of most of the advocates of intelligent design, which is one of the reasons why I said they seem to excommunicate themselves from the scientific community.

Q. Are you being compensated at all for your testimony in this case?

A. No, sir, I am not.

Q. Are you having travel expenses covered?

A. I haven't had any travel expenses yet because it's a short commute, and I actually don't think I've had a conversation about that. I would be perfectly willing to pay for my own travel expenses to any trial, but I will tell you that if the plaintiffs offer to compensate me for my travel expenses, I will accept that compensation.

MR. MUISE: And that's all of the

Page 349

questions I have. I have a couple of documents I never got to that I wouldn't mind just marking and having them identify what they are.

MR. WALCZAK: What's the point if they haven't been discussed?

MR. MUISE: Well, they have indirectly. They're excerpts from his book, "Finding Darwin's God."

MR. WALCZAK: Yes, I mean if you haven't discussed -- I mean if there's no testimony about that, how would you --

MR. MUISE: Well, it's just authentication of the documents.

MR. WALCZAK: Well, I mean show me where in that document or what in that document you have specifically examined him about. You haven't showed him the document. I mean he may have made reference to the book.

MR. MUISE: I'm just going to ask him to look at these and acknowledge just for authentication purposes because I don't have time to get into further detail. We

Page 350

did discuss -- when we did discuss your book early on, there were some components in this that were discussed, but we just don't have the time to flush them out.

THE WITNESS: It's my recollection, however, that I never drew any quotations from my book, I never opened any pages, and you never confronted me with specific writings on any particular pages in the book.

MR. MUISE: With that said, I'm going to mark these three -- we'll mark these as -- we should mark them as three separate exhibits.

THE WITNESS: So 15, 16 and 17?

MR. WALCZAK: I'm going to object to the introduction of those, and we're certainly not stipulating or agreeing to any authentication of those documents, but you can certainly make them part of the deposition. Note my objection.

BY MR. MUISE:

Q. You can't authenticate whether these are sections from your book?

Page 351

A. If you show it to me, I will --

Q. Show you the book?

A. No, no, no, if you hand that to me and ask me to say if that's the cover of my book, my answer would be yes, this is the cover of my book.

Q. Front and back cover?

A. And this is the book cover, and I would note that this is the paperback edition rather than the hard cover edition.

Q. And that is 15. And then 16 is a few pages from chapter 9, if you'll identify the pages.

A. The pages are all over the map. I would assume because I don't have a copy of the book to compare it to, that these are authentic copies of pages 260 and 261.

Q. If you want to compare it to the actual original book.

A. Without reading every word, that's correct. Yes, this is page 290 and 291, and this is the conclusion of the book on page 292, and yes, it looks like an authentic copy.

Q. And then this will be Exhibit 17.

A. No. 17, oh, my goodness.

Q. And that should be the complete chapter, if you want to --

A. In the interest of time and being reasonable, I will stipulate that on first glance, which is all I have time for, this does look like an authentic copy of chapter 5.

MR. WALCZAK: I'm not sure what the purpose of introducing these as part of the deposition since I mean you haven't pointed to any responses that he gave or questions that you asked specifically about that chapter.

MR. MUISE: I think the point being that he's authenticated this as the book that he had written, and there were questions that weren't specifically directed to this that were related to this that I can point out to in these --

MR. WALCZAK: Well, you can do that at trial. I don't see the purpose of attaching it here. I mean what's the purpose of that?

MR. MUISE: Because we'll have an authentic record of the portions from his book that he's --

Page 353

MR. WALCZAK: No, he referred to the Prentice-Hall dragonfly book, and you're not attaching a copy of that.

MR. MUISE: Sections of it we are.

MR. WALCZAK: But sections were not the sections that he specifically read from.

MR. MUISE: Rather than continuing on with this argument, do you have objections to the authentication of this? Now, whether or not -- how you're going to use it or how it's going to be applied is a separate question. What is your objection to these being marked as Exhibits 15, 16 and 17 to this deposition?

MR. WALCZAK: That they have not been specifically discussed here during this deposition.

MR. MUISE: They've been authenticated by your witness; is that correct?

MR. WALCZAK: Yes, he has authenticated them. Those are portions of his book. I don't see the purpose of including them other than to increase the cost of these transcripts. My objection is noted.

MR. MUISE: Your objection is noted.
(Defendant's Exhibit Nos. 15, 16 and 17 were marked.)
MR. MUISE: I don't know whether you want to state whether you care to read your deposition so that I can –
MR. WALCZAK: We're not going to waive signature.
MR. MUISE: And the last point, just to make it on the record, there was several references to names throughout this deposition that are going to require spellings, and my understanding is from discussions with counsel is that we will agree if the court reporter sends a list of words that she needs clarification about to the witness with CC to myself and to the plaintiff's counsel, that that would be satisfactory for all the parties; is that correct?
MR. WALCZAK: I agree.
THE WITNESS: I'd be very happy to do that.
MR. MUISE: And sending it by e-mail I

think would be probably the most expedited way of doing it.
THE WITNESS: That's also okay with me.
MR. MUISE: Thank you. That concludes this deposition.
THE WITNESS: Thank you.
(Deposition concluded at 6:30 p.m.)

CERTIFICATE OF OATH

STATE OF RHODE ISLAND)

I, DENA M. O'BRIEN, Certified Shorthand Reporter and Notary Public in and for the State of Rhode, do hereby certify that on May 25, 2005, KENNETH MILLER, the witness whose deposition is hereinbefore set forth, was duly sworn by me and that such deposition is a true record of the testimony given by the witness.

I further certify that I am neither related to or employed by any of the parties in or counsel to this action, nor am I financially interested in the action.

In witness whereof, I have hereunto set my hand and seal this 31st day of May, 2005.

DENA M. O'BRIEN
CERTIFIED COURT REPORTER/NOTARY PUBLIC
Commission ID#: 53043
My commission expires: 03/23/08

1. ERRATA SHEET DISTRIBUTION INFORMATION
2. DEPONENTS ERRATA & SIGNATURE INSTRUCTIONS

1. ERRATA SHEET DISTRIBUTION INFORMATION:
The original of the Errata Sheet has been delivered to Witold Walczak, Esquire.
When the Errata Sheet has been completed by the deponent and signed, a copy thereof should be delivered to each party of record and the ORIGINAL forwarded to Robert J. Muise, Esquire, to whom the original deposition transcript was delivered.
2. INSTRUCTIONS TO DEPONENT:
After reading this volume of your deposition, please indicate any corrections or changes to your testimony and the reasons therefor on the Errata Sheet supplied to you and sign it. DO NOT make marks or notations on the transcript volume itself. Add additional sheets if necessary. Please refer to the above instructions for Errata Sheet distribution information.

PLEASE ATTACH TO THE DEPOSITION OF: KENNETH MILLER
DATE TAKEN: MAY 25, 2005
CASE: KITZMILLER, ET AL. vs. DOVER AREA SCHOOL DISTRICT, ET AL.

ERRATA SHEET

PAGE	LINE	CHANGE	REASON

I have read the foregoing transcript of my deposition and except for any corrections or changes noted above, I hereby subscribe to the transcript as an accurate record of the statements made by me.

Executed this day of , 2005.

Kenneth Miller